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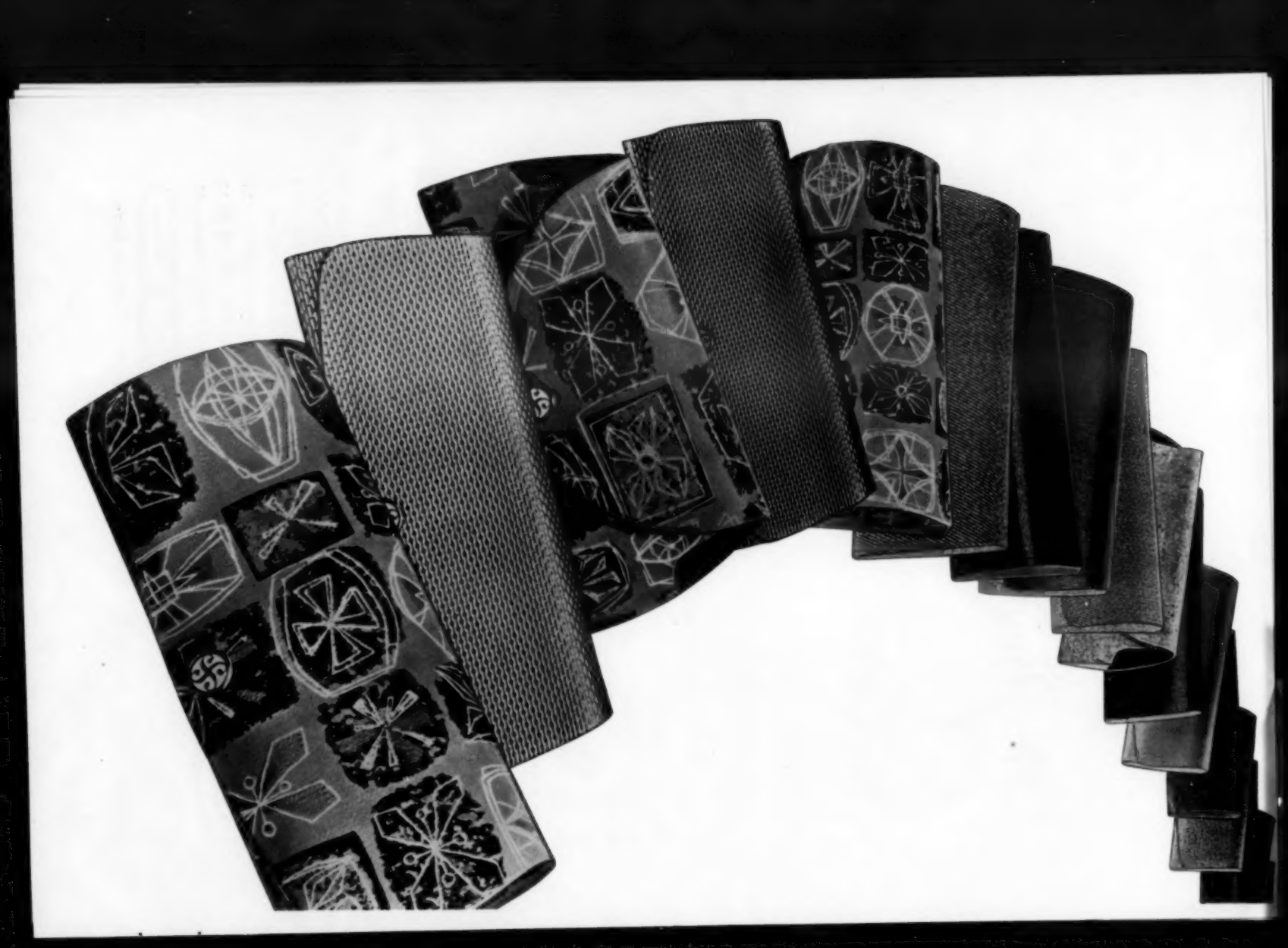

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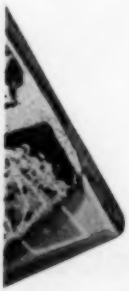

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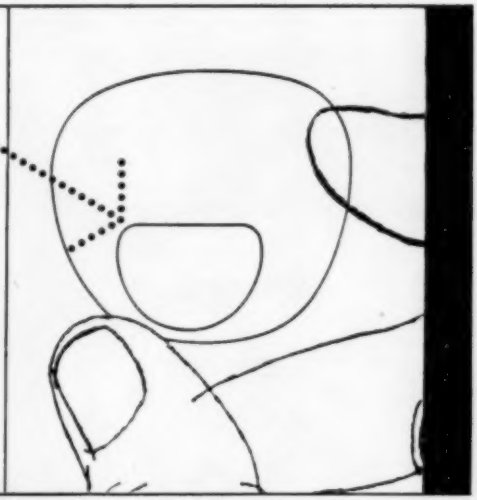

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ACCOMMODATIVE RESPONSES ASSOCIATED WITH THE WESTPHAL-PILTZ PUPILLARY PHENOMENON*

Phillip R. Haynes†
Newark, Ohio

The present experimental and clinical investigation was carried out so that an insight might be gained into the neuro-physiological basis of the various components of the accommodative response. The case under discussion illustrates certain lower order accommodative reflexes associated with the Westphal-Piltz[1] phenomenon.§ Such reflexes may prove to be of diagnostic aid in determining if the loss of accommodation in the non-presbyope is due to a true internal ophthalmoplegia or is due to a pseudo-ophthalmoplegia resulting from a supranuclear or internuclear involvement in the accommodative pathways.**

The seventeen-year-old white male enlistee was seen in our clinic for a routine refraction. His primary complaint was of discomfort and blurring which occurred during reading. This difficulty had come on rather gradually over the past three years and he felt that the asthenopic symptoms were closely associated with an acquired anisocoria (acquired Adie's pupil)[4] which he first noticed two years ago. (See Figure 1.)

Fig. 1.

*Submitted on February 4, 1957, for publication in the August, 1957, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

†Optometrist. Fellow, American Academy of Optometry.

§This pupillary response associated with forced closure of the lid is also referred to as the Gallassi-Gifford reaction.[2]

**The author[3] has observed the absence of this accommodative response associated with the Westphal-Piltz Phenomenon in one case of a twenty-year-old having complete, bilateral loss of accommodation.

The patient has been wearing spectacles for approximately five years, having had them changed three times in the last year with little or no relief of his asthenopia. He noted no other symptoms such as partial blindness, flashes of light in his visual field, pain in the region of the eyes or ocular adnexa, or headaches.

About one year ago he received a blow on his right ear, after which he had recurrent attacks of tinnitus and spinning counterclockwise associated with weakness of both legs for periods of one to three minutes. These occurred at irregular intervals and completely disappeared after a period of three months. It is to be noted that his anisocoria appeared approximately one year before this injury.

The history is otherwise negative, the patient reporting that he has always been in excellent physical condition. There is no history of anisocoria or Adie's pupil in any other member of the family.

During the external examination of the eye it was noted that the right pupil was appreciably larger than the left pupil. (See Figure 1.) At this point of the examination it was noted that the pupils manifested the palpebrae reflex or Westphal-Piltz phenomenon. (See Figures 2 and 3.)

The clinical examination and experimental results were as follows:

External examination: The ocular adnexa of each eye were normal. The patient manifested an anisocoria with the right pupil being larger than the left pupil. It was conditionally diagnosed as an Adie's pupil.*

*Adie's Pupil (pupillotonia, mytonic pupillary reaction, non-leutic Argyll-Robertson pupil, pseudo-Argyll-Robertson Pupil, tonic pupil) exhibits the following characteristics:[5, 6, 7]

(1) Occurs unilaterally in 80% of cases.
(2) The affected pupil is usually larger than that of other eye.
(3) The reaction to light, both direct and indirect, is almost or completely abolished, but pupil dilates slowly in a dark room and contracts slowly on prolonged exposure to light.
(4) Some authorities state that the pupil constricts as a result of convergence. There is a delay which may be as long as five minutes, and then the pupil contracts slowly until it may become smaller than the normal pupil. When the convergence effort is discontinued, the pupil slowly dilates. Walsh states that this finding is rare.
(5) The affected pupil reacts normally to mydriatics.
(6) Occurs in females more often than in males, in ratio of 4 to 1. Usually occurs at age of 20 to 30.
(7) Occurs more often in left eye than in right.
(8) The affected pupil often has a variable diameter under identical conditions.
(9) There is often an involvement of accommodation associated with the affected pupil. The involvement is characterized by inertia (slowness) of accommodation and a lowered amplitude. The accommodation may be completely paralyzed.
(10) There is often an associated areflexia of certain reflexes such as the knee-jerk.
(11) There is often an associated neurotic factor.

Fig. 2 at top.
Fig. 3 at bottom.

Ophthalmoscopic examination: The discs of each eye were normal. The color was good and the disc outline sharp. There was normal physiological cupping. The color of the fundus was normal. There were no exudates or hemorrhages. The vessels were normal. The optical media were clear with no signs of pathology, or trauma.

Slit lamp biomicroscopy: O.D. The lens appeared normal with no abnormal sclerosing. The iris showed no signs of atrophy. O.S. The lens appeared normal with no abnormal sclerosing. The iris showed no signs of atrophy.

Refraction: Visual acuity without lenses: Twenty foot distance, O.D. 20/200, O.S. 20/30. Forty centimeters distance, O.D. less than J-12, O.S. J-3. Visual acuity with old lenses: O.D. 20/25, O.S. 20/25 for distance and O.D. less than J-12, and O.S. J-1 for near. The former correction was

O.D. +1.25 D. sph. ⌒ +0.50 D. cyl. axis 85.
O.S. +1.25 D. sph. ⌒ +0.25 D. cyl. axis 85.

Static skiametry:

O.D. +1.25 +0.75 X 90
O.S. +1.25 +0.75 X 90

Subjective:

O.D. +1.00 +0.50 X 90
O.S. +1.00 +0.50 X 90

With this prescription, distance visual acuity was O.D., O.S. and O.U. 20/20. Near visual acuity was O.D. less than J-12, O.S. J-1.

Distance phoria (6 meters): lateral component: orthophoria: vertical component: orthophoria: cyclo component: orthophoria.

Muscle fields: Ductions (monocular): O.D. and O.S. unrestricted. Versions: voluntary: normal, pursuit: normal. Vergences: N.P.C.: 7 cm.

Monocular Jackson cross cylinder (40 cm.)

O.D. +2.25 add, V.A.: J-1
O.S. +0.75 add, V.A.: J-1

Monocular minus lens to blur,* (fine focusing target located at 40 cm.)

O.D.: +1.75 add
O.S.: —1.75 add

Monocular plus lens to blur (fine focusing target located at 40 cm.)

O.D. +2.75 add
O.S. +2.50 add

Investigation of the pupillary responses:

(1) Tourney's reaction:[10] No observable response.

(2) Dark reaction:[11] (See Figure 4.) The patient was dark adapted in a completely dark room for a period of ten minutes. Note that the left pupil is not as dilated as the right pupil.

(3) Light reflex: (See Figure 5.) (a) Direct reflex to the right eye: The pupil was very sluggish and contracted approximately one millimeter (7½ to 6½ mm.) as a result of prolonged exposure of light from an A.O. giant ophthalmoscope lamp** exposed for durations of 15 to 180 seconds. (b) Consenual reflex to the right eye: Same as direct reflex to the right eye. (c) Direct reflex to the left eye: The pupil was mildly sluggish, constricting from six to four millimeters on prolonged exposures of light from an A.O. giant ophthalmoscope exposed for durations of 15 to 60 seconds. (d) Consenual reflex to

*The difference between +2.25 and +1.75 in the right eye can be attributed to the depth of focus. This finding can be interpreted as an indication of cycloplegia in the right eye. Alajauanine and Morax[8] and Morgan and Harrigan[9] have reported the lowering of the amplitude of accommodation associated with Adie's pupil.

**The A. O. Giant ophthalmoscope was set at six volts.

Fig. 4 at top.
Fig. 5 at bottom. The above picture which was taken after the eyes were exposed to flood lamps for a period of five minutes shows the maximum pupil response to light.

the left eye: Same as direct reflex to the left eye.

(4) Near reflex:[13] The left eye manifested a normal response, while the right eye manifested a response of approximately ½ mm. It was delayed with respect to the pupillary response of the left eye.

(5) Westphal-Piltz phenomenon or palpebrae lid reflex: (See Figures 2 and 3.) (a) Forced closure of the right lid: The patient forced his lid closed against the resistance of the authors finger, resulting in a reflex constriction of the pupils. The right pupil constricted to 4 mm. The left pupil manifested the same reflex reaction, but to a milder degree. (b) Forced closure of the left lid: Same response as (5a) above.

(6) Pharmacological response of the pupil.* Three drops of 0.25% physostigmine salicylate solution were placed in the cul de sac. After approximately 15 minutes the pupil constricted to 2½ mm. and was non-reactive to light.

The above experiments and clinical findings led the writer to wonder if there was an accommodative response associated with the

*Scheie[15] describes a pharmacological test for the diagnosis of Adie's pupil in which a 2½% solution of mecholyl is used. He states that an Adie's pupil will contract maximally as a result of instilling mecholyl in this dilution.
Duke-Elder[16] describes the use of physostigmine as a diagnostic test for Adie's pupil.

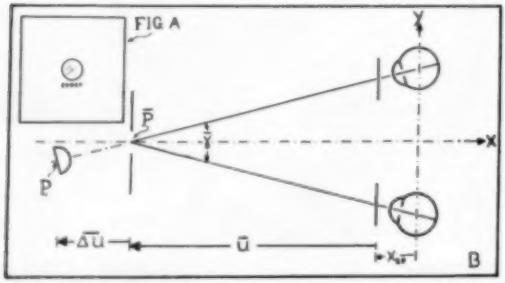

Fig. 6.

Westphal-Piltz phenomenon. The relationship between the state of accommodation in the two eyes was verified by a direct method involving a modified dynamic skiametry technique.[14] (See Figure 6.) A near point card (Figure 6-A) consisting of 20/30 letters mounted just below a one inch aperture was placed on the reading rod at a given distance μ, from the spectacle plane. The subject viewed the target binocularly and was instructed to keep the letters clear at all times. With this technique the writer could observe the retinoscopy reflex of either eye through the small aperture or if necessary in front of the plane of the near point card. In the typical case the examiner will observe a "with motion" when scoping in the same plane as the target. However, if one moves back from the target he will reach the "neutral point" and finally "against motion." The neutral point, P_1, was determined n times for each experimental procedure and the average and range of the positions were calculated.

The following experiments on accommodation were carried out with the distance correction in place.

The subject fixated a 20/30 line of letters which were located at a distance of six meters. He read them with his left eye while the examiner determined the neutrality point of the right eye with a +1.50 D. lens before the right eye. This was repeated five times and the average was found to be 65 cm. with a range of ±1 cm.

The near point of accommodation was determined for the left eye by the monocular push-up or Donder's technique. It was found to be 19 cm. or 5.25 diopters. This is 7.25 diopters lower than the expected for his age.

The subject fixated a fine focusing target consisting of 20/30 Snellen letters placed 40 cm. from the spectacle plane. The subject read the letters with his left eye while the examiner determined the

location of the "neutral point" of the right eye. The "neutral point" was determined five times and found to be located at 63 cm. (±1 cm.) from the spectacle plane. Now, if one determines the dioptric difference between the neutral point in case one and this finding, he will note that there is approximately 0.05 diopters of accommodation in the right eye resulting from a 2½ diopter change in the accommodative stimulus to the left eye. One can assume that the dioptric response of the left eye approached the dioptric stimulus for the experimental set up was such that the letters were presented under dim illumination. This helped control the pupil size, leaving it in a semi-dilated state thus reducing the magnitude of the depth of focus. The subject's response to the letters was rapid and accurate, indicating that the target was well focused.

The subject fixated a fine focusing target located at his punctum proximum with his left eye and the examiner determined the location of the neutral point of the right eye. Then the subject forced his left eyelid closed against the resistance of his finger. The neutral point of the right eye was redetermined and recorded. This procedure was repeated five times and the results listed in Tables 1 and 2. Statistical

TABLE 1
Changes in the dioptric responses of the right eye as a function of forced closure of the left eyelid.

Before		After		Difference
61 cm.	(1.64D.)	48.5 cm.	(2.06D.)	0.42D.
64 cm.	(1.56D.)	49.0 cm.	(2.04D.)	0.48D.
65 cm.	(1.54D.)	49.5 cm.	(2.02D.)	0.48D.
65 cm.	(1.54D.)	47.0 cm.	(2.13D.)	0.59D.
63 cm.	(1.58D.)	47.0 cm.	(2.13D.)	0.55D.
		Mean dioptric difference		0.50D.

TABLE 2
Changes in the dioptric response of the left eye as a function of forced closure of the right eyelid.

Before	After	Dioptric Difference
21.0 cm.	18.0 cm.	0.80 D
19.6 cm.	16.5 cm.	0.96 D
20.5 cm.	17.0 cm.	1.00 D
20.75 cm.	16.0 cm.	1.06 D
19.25 cm.	15.2 cm.	1.38 D
	Mean dioptric difference	1.04 D

analysis shows that there is a dioptric change in accommodation associated with the forced lid closure.* The magnitude of this response was

*During retinoscopy one often notes an increased against motion immediately after an exaggerated closure of the lids. This could be a result of an accommodative factor associated with the forced closure of the lids.

0.5 diopters. It is to be noted that on one occasion after prolonged testing this response reached a magnitude of one diopter. This illustrates the inertia of this accommodative response as well as the role of facilitation.**

The change in the magnitude of the push-up amplitude of accommodation (Donder's technique) as a function of forced lid closure was determined by having the subject first determine the monocular amplitude of the left eye by determining the location of the just noticeable blur, and then, having the subject force his right eyelid closed against the resistance of his finger, and redetermining the location of the near point of accommodation. These subjective findings were similar to the objective findings listed in Table 2.

One can assume that the dioptric change in accommodation approached the dioptric difference between the two responses for the depth of focus was held fairly constant by using dim illumination on the test type. It is to be noted that there was little or no significant change in the size of the left pupil as a result of the Westphal-Piltz phenomenon.*

A quantitative investigation of the speed of accommodation was desired to obtain a better index of the inertia of accommodation. Quantitatively, one could demonstrate that the left eye manifested a much slower speed of accommodation than normal when the subject focused from distance to near and from near to distance. Prolonged viewing of a target placed at the punctum proximum of the left eye resulted in an increase of the amplitude of accommodation by as much as one diopter. This increase took over a period of 30 to 90 seconds and is to be distinquished from that component associated with the Westphal-Piltz phenomenon which took place in a matter of a few seconds. Both changes could be objectively recorded with a retinoscope.

Complete neurological, medical, radiological and laboratory examinations were carried out by the staff physicians. There were no other neurological involvements and the laboratory tests were negative. The serology was variable but the spinal tap showed no signs of neurosyphillis.

The A.C.A. was not determined for each eye fixating separately. It was felt that the findings would have little theoretical significance.

**A +1.50 working lens was placed in the spectacle plane of the right eye for this portion of the experiment.

*It is interesting to note that there was never any observable accommodative response in the right eye associated with prolonged viewing of near targets with the left eye. These targets were placed at the punctum proximum.

However, the findings of Morgan and Harrigan have been confirmed on one other case of Adie's Pupil.[19]*

CONCLUSIONS

The accommodative component associated with the Westphal-Piltz phenomenon could have either a physical or neurological basis.

One could propose a physical explanation by postulating that the pupil constriction associated with the Westphal-Piltz phenomenon resulted in a change in the pressure of the iris on the front surface of the lens. This in turn could alter the front curvature of the crystalline lens resulting in the accommodative component.

An alternate physical explanation is that the constriction of the pupil results in a change in distribution of tissue forces and tissue positions in the ciliary body as well as in the iris. Thus, as the iris tissue moves to constrict the pupil there is an associated movement of the ciliary body which results in a slackening of the zonules. This would result in an accommodative change. This theory can be checked by animal experiments.

Several authors [20, 21] have used the fluctuations in pupil response as a criterion of visual discomfort. The true physiological picture may be that the small fluctuations in pupil response bring about small changes in accommodation, thus resulting in an out of focus target. This results in a compensatory accommodative response to focus the target. These small compensatory accommodative changes may be the true physiological basis of visual discomfort. The various pharmacological experiments do not vitiate this conclusion.

An alternative approach would be neurological in nature. One could argue that there is such a bombardment of impulses on the Eddinger-Westphal nucleii from the Westphal-Piltz phenomenon, that there is not only an associated pupillary constriction but an overflow of impulses into the accommodative pathways resulting in the accommodative responses.

If one takes the second point of view, he could logically argue that the phenomenon demonstrates the integrity of the lower motor neuron and the final common path subserving both the accommodative and pupillary responses. Carrying the argument further one could postulate that the above findings could be based on a supra-nuclear or

*The slowness or inertia of accommodation associated with Adie's Pupil has been reported by Moore[17] and by Morgan and Harrigan.[18] Moore states that it occurs in one out of 15 cases. The author has found it to be much more prevalent than the statistics of Moore indicate.

internuclear lesion, knocking out the connections between the pretectal region and the Eddinger-Westphal nucleii and/or between the cerebral accommodative centers and the Eddinger-Westphal nucleii. Such a lesion or lesions could result in a loss of parasympathetic tone to the ciliary body and iris resulting in the semi-dilated pupil and cyloplegia. The Westphal-Piltz phenomenon could be normally masked by inhibitory fibers coming through the above postulated pathways. Thus, by removing the inhibitory influences of the higher centers, lower order reflexes have an exaggerated influence.

It would be of interest to investigate normal individuals on an optometer to see if there was an increased amplitude of accommodation associated with the forced closure of the eyelid.

SUMMARY

The author reports the presence of accommodative responses associated with the Westphal-Piltz phenomenon in an individual who has an apparent cycloplegia of one eye.

Two theories are proposed to account for the accommodative component. The neurological theory which is based on pseudo-ophthalmoplegic considerations appears to be the most plausable.

The findings of this paper may be of interest in the determination of the loss of accommodation in a non-presbyope. The findings were not confirmed in one case of complete, bilateral cycloplegia in a twenty-year-old. The explanation could be that the one patient has a supranuclear lesion while the second has a nuclear or infranuclear involvement.

CLINICAL COMMENT

The patient was fitted with bifocals having adds determined by using the monocular cross cylinder technique at a distance of 40 cm. This prescription gave comfortable binocular vision at both distance and near. One must always consider the amplitude of vertical fusion in the choice of the bifocal. Due to the refractive anisophoria one must often use a compensated segment. The final prescription was as follows:

O.D. +1.00 D sph. ⌒ +0.50 D. cyl. axis 90.
O.S. +1.00 D sph. ⌒ +0.25 D. cyl. axis 90.

Bifocal additions:

O.D. +2.25 D. sph., O.S. +0.75 D. sph.

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FACTORS INFLUENCING STEREOSCOPIC LOCALIZATION*

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Whereas considerable experimentation has been reported in the literature concerning those factors involved in monocular and binocular judgment of distance within the visual field, little material has been available that has been applicable to the clinically important problems of measurements of stereoscopic localization and size of targets. It is hoped that the results of this study, which is preliminary in nature, can suggest further, more specific, experiments dealing with the problems in this area.

The problem. First it was the purpose of this study to quantify changes in stereoscopic localization** of a certain target, when varying the target separation,*** as a function of: (1) the changing of the size of the target; (2) the viewing of the target through minus spherical lenses; (3) the viewing of the target through base-out prismatic lenses; and (4) the viewing of the target through minus spherical lenses combined with base-out prismatic lenses. Second, this study investigated changes in the stereoscopic size§ of this target as a function of changes in the target separation.

Review of the Literature. Those factors which could account for the judgment of distance within the visual field have been of interest for many centuries. Amongst the early experimenters was Leonardo da Vinci (1452-1519)[1] whose position was that the relative distance of an object is revealed mostly by perspective (which he subdivided as linear, detail, aerial and movement perspective). Leonardo also observed

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**The distance, set by the observer, between the midpoint of the transverse axis of the observer and the measuring bar. See "Method."

***The distance between the centers of the ring targets as measured at the plane of the frosted glass screen. See "Method."

§Those measurements of the horizontal and vertical dimensions of the "fused" ring target, as seen by the observer. See "Method."

that together the eyes see the whole space behind the object.[2] In 1709 George Berkeley advanced the opinion that distance estimates are an act of judgment grounded on experience rather than sense.[3] His general theory was that spatial appearance of seen objects is not strictly visual but instead derived by association from touch and bodily movement.[4]

Following Leonardo's concept, in 1838 Wheatstone held the position that the two eyes, because of their placement in the head, obtained different views of an object. Wheatstone was able to produce quite vivid depth effects by using simple outline drawings (disparate views) of geometrical objects in his instrument, the stereoscope. From his work he concluded that the disparate views obtained by the two eyes from the same (near) object were the prime factor in the perception of depth.

Other so-called depth "cues" have also been suggested, such as: (1) superimposition; (2) light and shade; (3) filled and empty distance; (4) double images of other objects in the field of view which lie nearer or further than the fixated object; and (5) relative size.

Wundt (1859-1861)[5] was the first person to design an experiment intended to investigate accommodation and convergence in estimating the distance of an object. Wundt concluded that convergence was more important than accommodation in the perception of depth. Wundt's conclusions were challenged later by Hillebrand (1894)[6] when he designed an experiment using monocular vision only. It was his conclusion that accommodation does not mediate the perception of distance. In 1896[7] Arrer repeated Wundt's experiment and defended him. Baird, in 1903[8] used Hillebrand's form of apparatus but followed Wundt in employing both binocular and monocular vision. His results indicated that the thresholds for binocular vision are much smaller than for monocular vision. Because of objection to the targets previously used, Bourdon (1902)[9] and Peter (1915)[10] modified this experiment by using a circle of light as a target. Their results indicated the estimation of distance under binocular conditions is more accurate compared to that obtained under monocular conditions.

Bappert (1923)[11] repeated the experiments of Wundt, Hillebrand and Bourdon (with some modifications) and concluded that the tactile-kinesthetic sensations of accommodation and convergence contribute very little to the accurate determination of distance.

Wheatstone (1852)[12] and Judd (1897)[13] conducted experiments with a stereoscope to determine whether convergence was a controlling factor in what they termed "apparent distance." Both experi-

menters found: (a) that a decrease in apparent size of the object accompanies increasing convergence, and (b) that the apparent distance of an object would for some observers lessen and for others remain indefinite with increased convergence.

Concerned with the same problem, Carr, Swenson, Fisher and Lowenbach (1932-1935)[14] varied the actual distance and "convergence distance" of the target independently and found that the apparent distance increased with the convergence distance; the greater this distance the greater was the apparent distance. Both the earlier experiments and those experiments using the stereoscope of Wheatstone and Carr indicate that the localization of an object in space can be ordered largely upon the so-called visual cues rather than in terms of tactile-kinesthetic sensations of accommodation and convergence.

Quite specifically related, to the experimental procedure in this report, were the experiments of Brock (1947-1948).[15] With a Keystone overhead projector, Brock projected a red (green free) and green (red free) ring onto a screen at a distance of nine feet. Each ring contained a central disc of similar color. The separation of the rings and discs, on the projection screen, could be varied in a lateral direction by a gear arrangement contained in the projector. The outside diameter of the ring was 18.5 inches and of the disc 5.5 inches. These targets were viewed at a distance of ten feet through red and green filters which allowed one ring and disc to be seen by one eye only and the other ring and disc to been by the other eye only. When the target separation was varied the response of the observer was that the ring and disc appeared to be "floating" toward the observer with crossed* target separation and appeared to be "floating" away from the observer with uncrossed target separation. A ring stand, with a rule attached, was introduced between the observer and the screen, the distance of which stand could be varied by the experimenter. Using this type of apparatus Brock made measurements, as to where the ring and disc appeared as well as measuring the apparent size of the target. By substituting physical values into an equation based upon the geometric projection of the targets, Brock found that he could predict the localization of the observer. His prediction was based on the following formula:

*If a line be drawn connecting the centers of the optical systems on each side of a stereo-projector with the centers of the projected ring targets for each side respectively, and these lines cross in front of the screen onto which the rings have been projected, it is termed *crossed* target separation; if the lines cross behind the screen it is termed *uncrossed* target separation.

$$Db = \frac{P \cdot Ds}{Vr + P}, \text{ where}$$

Db is the distance between the observer and the perceived target,

P is the interpupillary distance of the observer,

Ds is the distance between the observer and the projection screen, and

Vr is the separation of the target on the screen.

Brock also gives an equation for predicting the size of the "floating" target. It follows:

$$Sb = \frac{(Ds - Db)\,Sr}{Ds}, \text{ where}$$

Sb is the calculated size of the "perceived" target, and

Sr is the size of the projected target on the screen.*

The experimental findings on an observer indicated a close agreement** between the calculated and measured values.

Method. With a Lutes stereo-projector two ring targets were projected onto a frosted glass screen which was mounted perpendicular to the floor. (Figure 1) The distance between the centers of those rings (target separation) could be varied by a gear arrangement contained in the projector. Either a "crossed" or "uncrossed" target separation could be obtained by reversing the direction of rotation of the gear. Measurements of the amount of target separation were made by placing a metal rule on the surface of the screen hereby allowing the target to "project" a reading on the scale of the rule†. On the opposite side of the screen from the projector there was mounted a sheet of plate glass which was also perpendicular to the floor and at an angle of 45° with the frosted screen. The distance between the center of the plate glass and the frosted glass screen was one meter. A virtual image of the targets was produced by the plate glass acting as a plane mirror. The observer was so situated that his line of sight was parallel to the frosted glass screen, at an angle of 45° with the plate glass, and at

*Whereas this is the way in which the equation appeared in the paper it is presumed that Brock intended it to appear as:

$$Sb = \frac{Db \cdot Sr}{Ds}$$

**The calculated distance of the target was 61 inches, the measured distance 60 inches. The calculated diameter was 9.4 inches, the measured diameter 9.5 inches.

†It was estimated that the accuracy in making this measurement was within ± 1.0 mm.

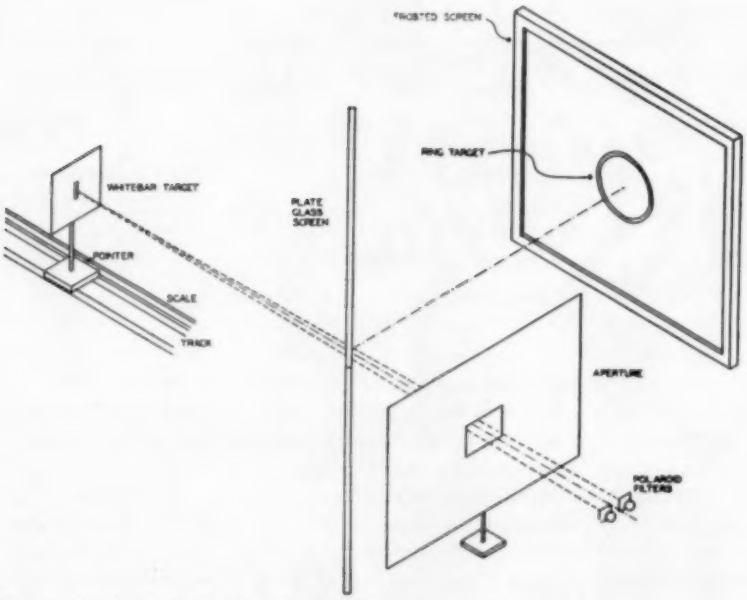

Fig. 1. An isometric drawing of the apparatus.

right angles to the line of projection. The position of his head was held constant by a chin and head rest. Since the distance between the observer and the center of the plate glass was 90 cm. and the virtual image of the ring target was one meter behind the plate glass, the target (image), from the observer, was optically at a distance of 190 cm. and along his direct line of sight. The projecter and observer were both "equipped" with suitable polaroid filters thereby making it possible for one ring to be seen with one eye only and the other ring to be seen with the other eye only. A screen standing between the observer and the frosted glass screen made it impossible for the observer to see any rings except by looking "through" the plate glass screen. A rectangular aperature was mounted between the observer and the plate glass allowing only the targets and a limited surround to be seen.* The frosted glass screen was so illuminated that this surround (which was also a virtual image) was a homogeneous gray field.

Mounted on a sliding track, that ran parallel to the observer's line of sight, was a vertical white bar of light (1 x 5 cm.). The dis-

*The angular fields of view were 10°46′ vertically and 21°18′ to 22°46′ horizontally for interpupillary distances of 58 mm. and 72 mm. respectively.

tance between this bar and the observer could be varied (by the observer) by use of a system of ropes and pulleys which allowed the observer to decrease this distance by pulling one rope and to increase this distance by pulling another rope. Both ropes were long enough to reach behind the observer, he therefore being unable to determine where he was grasping the rope in reference to its length.

The observer's field of view then consisted of the vertical white bar of light centered in the ring targets seen in a gray homogeneous field, everything being centered in the rectangular aperature.

Since the projector and observer were both equipped with polaroid filters it was possible, by varying the target separation, as projected on the frosted glass screen, to introduce certain amounts of separation in the ring targets. The response of the observer was that he saw one ring** centered around a vertical white bar and that the distance of the ring, relative to the observer, appeared to be decreased whenever the experimenter introduced a crossed target separation and increased whenever the experimenter introduced an uncrossed target separation. Changes in target separation, as described in the following section of this paper, were introduced and at each such setting the observer was asked to place the vertical white bar in the same plane as the ring, while maintaining fixation on the vertical white bar. The distance between the observer and the vertical white bar was read from a scale attached to the track on which the bar was mounted.

Procedure. The experimental procedure was separated into three parts: (1) using, as the independent variable, the size of the ring target; (2) viewing the target through minus spherical lenses, base-out prismatic lenses, and minus spherical lenses combined with base-out prismatic lenses as the independent variables; and (3) measuring the apparent size of the ring target as a function of the target separation.

Whereas it would have been desirable, to (a) have used the same observers for each experimental condition or (b) to have used different observers for each experimental condition, it was not possible. As a result, some of the observers participated in only one phase of the experiment while others participated in more than one phase of the experiment. It was necessary to take these measurements at several sittings on different days. So that an estimate of the reliability could be made, measurements were taken for one observer, under the same

**Total cancellation of the rings was not possible. As a result the observer could see, binocularly, a bright central ring and also two dim rings. The dim or "ghost" rings were reduced to a minimum by flooding the frosted glass screen with light, thus making a more "dense" background for the bright control ring.

experimental conditions (0 cm. target separation, 20 cm. ring), on three different days, there being one day between each of these three when measurements were not taken. An average deviation of 0.32 cm. and an extreme deviation of +0.9 cm. and —1.2 cm. was found. The conclusion was made that the reliability of the results, using this experimental method and procedure, was adequate for this study.

1. *Varying the size of the ring target as the independent variable.* Starting with 0 cm. target separation and going in steps of 1, 2, 3, 4 and 5 cm. for crossed separation and in steps of 1.0, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5 and 5.0 cm.* for uncrossed separation, measurements were taken by having the observer place the vertical white bar in the same plane as the ring. Five such readings were taken for each target separation and a mean of these five readings was used as the measurement of the distance of the "fused" ring target for that particular setting of target separation. After the observer made his adjustment of the vertical white bar, he released the ropes, the reading was taken by the experimenter, and then the experimenter moved the bar either closer to or further from the observer thus indicating to the observer that another measurement could now be taken.

Measurements of this nature were taken at each of the above mentioned target separation settings, using a ring target with an outside diameter of 10 cm. (2°52′), 20 cm. (5°43′), and 30 cm. (8°52′),** as measured on the frosted glass screen, on each of ten subjects.

2. *Viewing the target through minus spherical lenses, base-out prismatic lenses, and minus spherical lenses combined with base-out prismatic lenses as the independent variables.* The same procedure as in 1 above was followed with the difference that only the 20 cm. ring was used. Measurements similar to those above were taken on each of ten subjects as the observers wore a minus one diopter lens before each eye, then a three prism diopter (six in total) base-out lens before each eye and then a combination of the spherical and prismatic lenses.

3. *Measuring the apparent size of the ring target as a function of the target separation.* In this part of the experiment the diameter of the ring target was 10 cm. Target separation settings were in general 0 cm. to start, then 2 cm. and 4 cm. for crossed separation and 1 cm. and 2.5 cm. for uncrossed separation. Some of the observers found it

*Many of the subjects could not keep the rings "fused" at the extreme target disparity setting. Therefore the measurements at these points for these subjects were not obtainable.

**These angular measurements are subtended at the observer's eye.

difficult to see singly the ring target with increased amounts of separation and as a result the measurements on these individuals were taken with less target separation.**

The observer was asked to place the vertical white bar in the apparent plane of the ring, as previously done. The bar for this part of the experiment was mounted on a black unstructured surface, behind which was a sheet of carbon paper and a white recording sheet. A wand containing a white bar similar to the central target was then introduced by the experimenter at the plane of the central vertical bar and moved from the periphery of the field of view slowly toward the center of the field along the 90° and 180° meridians until the observer reported that it touched the outside edge of the ring target. A stylus was then applied by the experimenter to the recording arrangement at this point, making a mark on the white recording sheet only. Three different recordings were made in each meridian and since the white recording sheet was not visible to the observer, he could not determine where the previous measurement had been made. The mean of these three recordings was used as the size measurement at that distance.

These measurements were taken for each of ten observers.

Results. Part 1. Figure 2 illustrates the curves obtained when the stereoscopic localization measurements are plotted as a function of the target separation for each of the three target sizes. As can be seen when these curves are superimposed essentially no difference exists comparing the various target sizes. It will be noted, however, there exists the greatest variability in the measurements taken with the 30 cm. ring target, slightly less with the 20 cm. ring target and still less with the 10 cm. target. The variability in measurements also increased as the stereoscopic localization distance increased.

A prediction can be made, calculated from the target separation, interpupillary distance and distance between the observer and the "perceived" ring target.* Figure 3 contains a predicted curve, for an average interpupillary distance of 6.4 cm. For comparison, the curve obtained with the 20 cm. ring is also included. It is evident that a discrepancy exists between the two curves which, for crossed target

**These size measurements were taken with a target separation of 1.0 cm. or 0.5 cm. unit (whichever came first) below that separation eliciting diplopia.

*$Dr = \frac{P \cdot Ds}{P + S}$ where Dr is the distance between the observer and the "perceived" ring, P is the interpupillary distance, Ds is the distance between the observer and the screen and S is the separation of the targets on the screen, S being a positive value for "crossed" separation and a negative value for "uncrossed" separation.

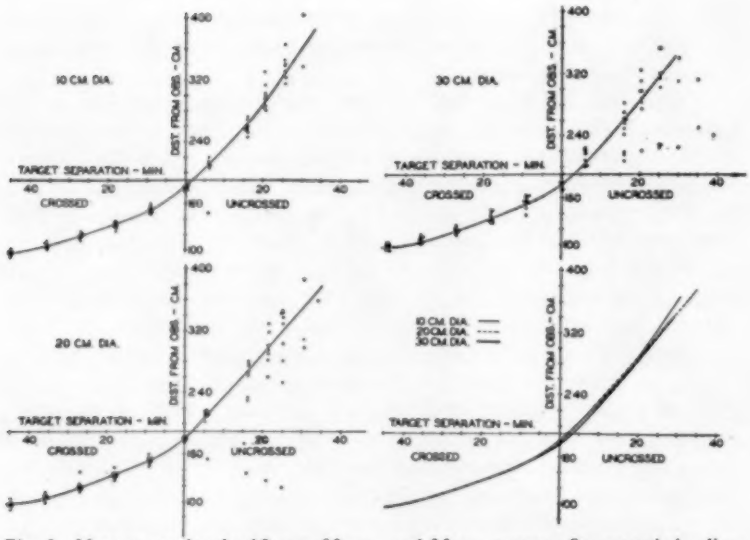

Fig. 2. Mean curves for the 10 cm., 20 cm., and 30 cm. targets. Stereoscopic localization (Y-axis) plotted as a function of the target separation in minutes of arc (X-axis).

separation, varies between 2 cm. and 10 cm. Because of the extreme variability in measurements taken for uncrossed target separation it is difficult to ascertain whether an agreement or discrepancy exists at distances greater than approximately 300 cm. It is of interest to note the position of the curve at zero target separation indicating the target to be localized approximately 7 cm. closer than the predicted value.

Part 2. Figure 4 illustrates those curves obtained while the observer was wearing minus lenses, base-out prisms and a combination of minus and prismatic lenses. Also included is a "control" curve obtained with no lenses in place in addition to the predicted curve. No consistent deviations seem to be present comparing the various curves. It is of interest to note the curve obtained with the minus and prismatic lenses combined follows closest to the predicted curve. All three of the curves obtained under the various lens conditions tend to break away from the control curve when the stereoscopic localization measurements reach approximately 320 cm. Several of the observers had considerable difficulty in seeing the target singly. Many of the observers not reporting diplopia found it difficult to keep the ring target "fused" as the lenses were worn. This was especially true at the increased amounts of target separation, both crossed and uncrossed.

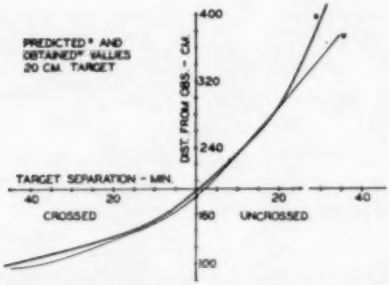

Fig. 3. Predicted and obtained values of the stereoscopic localization (Y-axis) plotted as a function of the target separation in minutes of arc (X-axis).

Part 3. The horizontal and vertical measurements of the stereoscopic size of the "fused" ring target have been plotted as a function of the stereoscopic localization distance of the ring target in Figure 5. The mean curve, for the group, indicates an increasing size in both

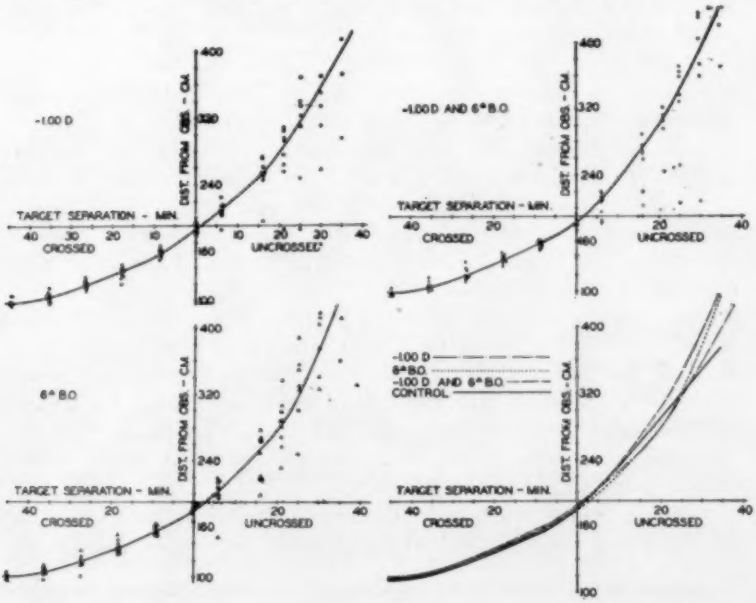

Fig. 4. Mean curves for the conditions of prism, sphere, prism with sphere and control. Stereoscopic localization (Y-axis) plotted as a function of the target separation in minutes of arc (X-axis)

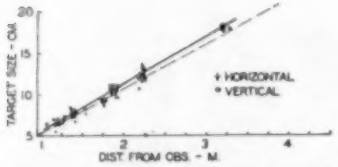

Fig. 5. Mean curve for the 10 cm. target. Stereoscopic size (Y-axis) plotted as a function of the stereoscopic localization distance (X-axis).

meridians with an increasing distance. Also plotted on the same coordinates is a predicted curve which has been calculated from the visual angle subtended, by the 10 cm. ring target at the plane of the virtual image (190 cm.), as it would be projected at distances other than 190 cm.* A comparison of the two curves indicates that the "perceived" diameter increases at a slightly greater rate than the diameter as predicted. It can be seen that the size measurements show very little scattering. For two of the observers the horizontal and vertical diameters of the ring target did not increase at the same rate, the rate being slightly less for the vertical diameter.

Discussion. The results of Part 1, where the size of the target was used as the independent variable, indicate that no appreciable difference exists in the stereoscopic localization measurements. It is difficult to make conclusions from the measurements taken at the increased amounts of uncrossed target separation since the variability in linear measurement increased considerably at this end of the curve. Greater linear difference would be expected with increasing distance, however, considering the linear distance traveled at various distances to equal the same number of angular units. There is still the question as to whether this variability is entirely a function of the distance at which the measurements are being taken or a function of other factors, as for example, the uncrossed target separation. Further experiments, using a greater range of target sizes, a range of distances between the observer and the virtual image of the target, and a larger sample are indicated. However, stereoscopic localization does not appear to change with a change in the size of the target.

Some of the individuals volunteered comments on their ability to see the ring target as single at the increased amounts of target separa-

*Starting with similar triangles and solving for the predicted ring diameter the equation becomes: $R = \frac{Dr}{20}$ in which R is the diameter of the "perceived" ring and Dr is the distance between the observer and the "perceived" ring.

tion. This seemed to be a relatively difficult task for some and very easy for others.

Figure 4, containing the mean curves for Part 2, indicates that there is some possibility that the distance measurements obtained while the observer viewed the target through the minus and prismatic lenses combined, are greater than those with no lenses, beyond a distance of 320 cm. Again it is important to realize the difficulty in measurement at the increased distances and therefore the difficulty in drawing a definite conclusion in this regard.

If, now, the assumption be made that accommodation and convergence contribute to stereoscopic localization and a further assumption be made that the posturing of accommodation and convergence would be at a lessened distance when the target is viewed through minus spherical and base-out prismatic lenses, respectively, it would follow that the localization response of the observer should be that of localizing the target at a lessened distance with these lenses as compared to without these lenses in place. If anything is indicated, however, it is the opposite effect taking place. It is granted, that before any conclusion can be reached more data, with a change in experimental conditions, would be necessary.

Since this experiment was designed to study essentially, stereoscopic localization responses under various experimental conditions it is not plausible to relate these findings obtained to the many studies that have been devoted to size constancy. It can be said, however, that there is a considerable change in size taking place as the target appears to come toward and go away from the observer. This rate of change in size approximates the prediction based upon a constant visual angle subtended by the 10 cm. ring at a distance of 190 cm.

Many other studies seem to be suggested by this report. It would be of interest to use target sizes both larger and smaller than those employed in this experiment. Measuring the stereoscopic localization as a function of the distance between the observer and the virtual image of the target is also suggested. Since it is possible to introduce enough separation between the targets to produce a doubling response it would be possible to determine a "break" and "recovery" point as a function of the size of the target, distance of the target, amount of separation, etc. More extensive studies designed to investigate the role of accommodation and convergence in stereoscopic localization, but not with the method and procedure used in this report, are also indicated. Not only could a threshold be determined similar to the work of Hirsch, Horowitz, Weymouth and Wilner[16, 17, 18, 19, 20] but also norms as to

the stereoscopic localization distance as a function of the target separation, with further experimentation. Investigation of the theoretical problem concerning the referential plane used by the observer in making judgments similar to those in this study is also indicated.

Summary. Because of the need for clinical information as to stereoscopic localization, this experiment attempts to employ techniques that will contribute to our present knowledge in this particular area of vision.

First, it was the purpose of this study to quantify changes in stereoscopic localization of a certain target, when varying the target separation, as a function of: (1) the changing of the size of the target: (2) the viewing of the target through minus spherical lenses: (3) the viewing of the target through base-out prismatic lenses: and (4) the viewing of the target through minus spheres combined with base-out prismatic lenses. Second, this study investigated changes in the stereoscopic size of this target as a function of changes in the target separation.

A Lutes stereo-projector with ring targets was used in conjunction with a central target, movable along the z-axis, which made it possible to measure the stereoscopic localization of the ring target at a particular setting of target separation.

Data are presented on ten observers for each part of the above experimental conditions. The results of this study suggest: (1) No appreciable difference exists in the stereoscopic localization measurements comparing the various target sizes; (2) If any change is to be noted in viewing the target through minus and base-out lenses it would be that of a tendency to shift the stereoscopic localization measurements to an increased distance in comparison to the "control" stereoscopic localization measurements: and (3) Stereoscopic size increases with stereoscopic localization distance and at a rate slightly greater than the rate obtained if the size is predicted from the visual angle subtended at each particular distance measured.

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ABSTRACT

NEW TREATMENT FOR AMBLYOPIA. Edward Hartmann, M.D. Paris, France. International Record of Medicine. 170. 6. 334. 1957.

This new type of treatment is based on the fact that many amblyopic eyes have a fixation off-center and that if one can re-establish a central fixation the vision improves dramatically. Instead of patching the good eye for months, it is now often possible, in a matter of four to eight weeks, to cure or to improve considerably quite a few cases of amblyopia, whether or not associated with strabismus. This treatment requires two new instruments. One, very similar to an ordinary ophthalmoscope, projects a small, sharply defined cross on the retina. When the child looks directly into the light, one observes at what point the cross is projected and what its relationship is to the macula. The treatment is undertaken only when this projection shows an excentric fixation. This requires the next instrument, called the euthyscope, which throws a strong light on the retina. The very center of the field is protected by a small screen, and this center is aimed exactly on the center of the macula. The result is that for quite some time the patient has a strong afterimage in the form of a dark circle with a clear center corresponding to the central macular area. This makes the child conscious of the real visual line corresponding to his fovea, and as he uses it, his visual acuity improves.

THE FIELD OF VIEW OF VISUAL AIDS*

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INTRODUCTION

The total extent of object space imaged on the retina when a visual aid is worn is limited in several ways. The position and size of the apertures in the visual aid are the most important factors and the only ones within our control. To some extent the pupil of the eye also plays a part but a minor one. At the outset, therefore, let us assume that the pupil of the eye is negligibly small. Later we will indicate to what extent a finite pupil size will modify results based on this assumption.

THE STATIONARY EYE

The simplest case of a visual aid is a thin spectacle lens worn at a distance h in front of the center of the entrance pupil. Let the optic axis of the lens pass through the center of the entrance pupil and let the edge of the lens in the half-meridian considered be at a distance c from the optic center. Let the lens be of power F and the object plane at a distance u from the lens. When F is in diopters all distances are measured in meters and are positive except u which is negative for the usual object-lens relationship.

Figure 1 illustrates the path of the ray from the most peripheral object point to reach O, the center of the entrance pupil. Object points in the same plane but further removed from the optic axis of the lens will send out rays which will either not reach the open aperture of the lens or, if they do, will be refracted in such a way that they do not enter the entrance pupil of the eye and hence do not reach the retina. In the present discussion it is assumed that the eye remains stationary with the primary line of sight coincident with the optic axis of the lens. The point Q will be the most peripheral object point in the half-meridian that is imaged on the retina by the lens and the optical system of the eye. It constitutes, therefore, the limit of the field of view of peripheral vision for the stationary eye.

From the diagram

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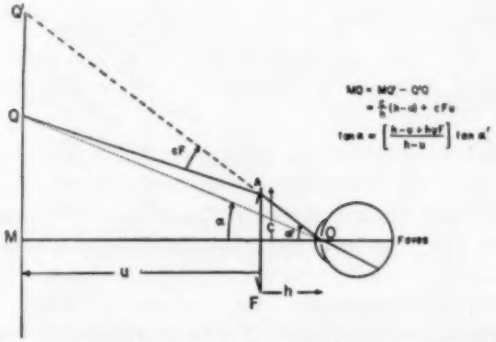


Fig. 1. Field of view for peripheral vision of a stationary eye. Ray QA is deviated by the lens through an angle cF and reaches O, the center of the entrance pupil of the eye. It appears to be coming from Q'. QM is the linear extent of the field of view in the object plane. Angle Q'OM may be described as the apparent angular field of view, while angle QOM describes the real angular field of view at the observation distance.

$$QM = Q'M - QQ' = \frac{c(h-u)}{h} + cFu = \frac{c}{h}(h - u + Fuh). \quad (1)$$

This to a first approximation expresses QM, the linear extent of the field of view, in terms of F, the power of the spectacle lens, h, the distance between the lens and the center of the entrance pupil of the eye, c, the aperture of the lens in the semi-meridian considered, and u, the object distance. When F is in diopters, c, h are in meters and positive, while u is in meters and negative for the object lens relationship shown in the figure.

Sometimes it is of interest to express the field of view in angular measure.

From Figure 1 it is seen that in the image space of the lens the ray which limits the field of view makes an angle a' with the foveal line of sight where

$$\tan a' = c/h. \quad (2)$$

This is, however, not a useful concept since no information is conveyed by it about the actual extent of object space which is imaged on the retina. a' may be called the *apparent* angular extent of the field of view of the lens. It is merely a measure of the lens size and the eye-lens separation.

One may also talk about the angular extent of the field of view in the object space of the lens, using the center of the entrance pupil

as the reference point. This angle may be called α, and we have

$$\tan \alpha = \frac{QM}{h - u} = \frac{h - u + Fuh}{h - u} \cdot \frac{c}{h} = \frac{h - u + Fuh}{h - u} \tan \alpha'. \quad (3)$$

This expresses the extent (in angular measure) of the object plane at the distance $h - u$ that is visible through the spectacle lens.

In many cases tan α is quickly evaluated since the coefficient of tan α in equation (3) often appears in magnification equations.[1, 2]

Equations (1) and (3) are fully valid within the limitation of the first order approximations used in their derivation. For objects at near distances, particularly reading aids for subnormal vision patients, it is suggested that the field of view be expressed in linear measure in object space, i.e., that equation (1) be used. The main aim of such devices is to enable patients to read and one aspect of their effectiveness in this direction is most clearly expressed by the linear extent of object space visible to the patient when he holds the reading material at the object distance for which they are designed. This concept may be restricted, as it was by Bechtold,[3] to that of the *usable* field diameter which takes into consideration only the extent of the object space imaged by the lens without more than a definite amount of aberration.

THE MOVING EYE

Quite a similar situation holds when we are dealing with the field of view for foveal vision of a moving eye. We shall still assume that the entrance pupil of the eye is a very narrow aperture. It is also assumed that the eye rotates about a fixed point, the center of rotation, which is taken to lie on the foveal line of sight as well as on the optic axis of the spectacle lens.

The field of view for foveal vision now extends to the point Q in Figure 2 such that the ray from Q to the edge of the lens is deviated by the latter to be directed along the foveal line of sight when the eye is rotated towards the edge of the lens. All points in the same object plane further removed from the optic axis will send out rays which either do not pass through the open aperture of the spectacle lens, or if they do, cannot be deviated by the latter to become foveal chief rays of the eye, no matter in which direction the eye turns. If t is the distance from the spectacle lens to the center of rotation, a set of equations may be derived analogous to equations (1), (2) and (3). They will differ from these merely by having t substituted for h. Since t is larger than h, the field of view for peripheral vision for the

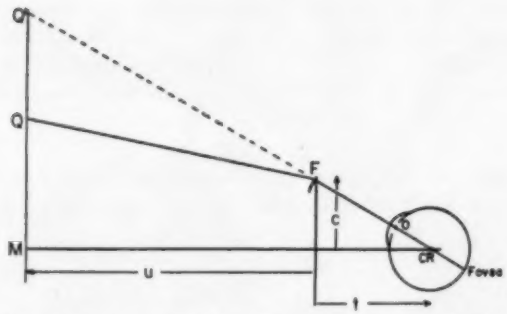
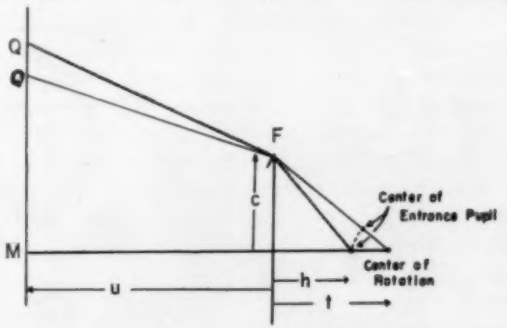


Fig. 2. Field of view for foveal vision of a moving eye. O is the center of the entrance pupil of the eye. CR is the center of rotation of the eye.

stationary eye will be larger than the field of view for foveal vision of the moving eye. This is illustrated in Figure 3. It accounts for the fact that when a visual aid is worn, there are objects one can see with peripheral vision which are no longer visible when the eye is turned to look at them. This phenomenon occurs both with minus lenses and with plus lenses.

In the present discussion no cognizance is given to rays reaching the entrance pupil of the eye not passing through the lens. Unless obscured by the spectacle frame they may form retinal images of regions of the object plane but these regions are not necessarily complementary



$MQ > MQ$

Fig. 3. Comparison of linear field of view for peripheral vision of a stationary eye and for foveal vision of a moving eye. The center of the entrance pupil at a distance h behind the lens is the reference point in the first case, the center of rotation at a distance t behind the lens in the second case. The field of view is always larger for peripheral vision.

to those imaged through the lens. In a plus correction a region equivalent to the distance QQ′ (Figure 1) will not be imaged at all, either through the lens or outside it—even with a rimless lens—and this is a "blind" area. Conversely in a minus correction there may be overlapping of the two regions with a resultant diplopia.

PUPIL SIZE

The effect of pupil size on the field of view is illustrated in Figure 4. The object point Q is the one we have already considered in

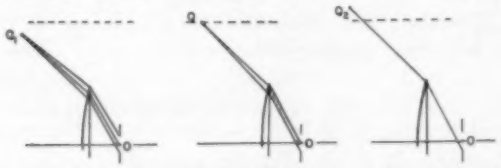


Fig. 4. Effect of pupil size on the linear field of view. Rays from object point Q_1 when refracted by the lens fill the whole of the entrance pupil. Rays from Q reach the center of the entrance pupil and fill the lower half of the entrance pupil. The ray from Q_2 just grazes the bottom edge of the entrance pupil.

The range of object points from Q_1 to Q_2 will be imaged on the retina of the eye with continuously decreasing illumination. Q will be the center of the range.

Figure 1. If the pupil of the eye is of appreciable size, rays from this object point will pass through the center of the entrance pupil and all the part of the entrance pupil below it. An object point Q_1, somewhat nearer to the optic axis of the lens, will have the property that rays from it refracted by the lens will fill the whole entrance pupil. There will be another object point Q_2, beyond Q, from which there will be just a small group of rays which when refracted by the lens will still pass through the entrance pupil near its bottom edge. We have thus a range of object points whose retinal images show a gradually decreasing level of illumination. The distance of points Q_1 and Q_2 from Q will depend on the size of the entrance pupil of the eye. In view of the magnitude of the other quantities, even a relatively large entrance pupil of the eye will not produce a really appreciable range Q_1 Q_2. This range will be centered on Q and hence MQ is still the most useful measure of the field of view.

APPLICATIONS

There are some special cases in which the expressions derived so far assume particularly simple forms.

Application A. Magnifier with the object in the focal plane: Here $u = -1/F$ and equation (1) reduces to

$$QM = c/hF. \qquad (1A)$$

The field of view of a simple magnifier with the object in its focal plane is, therefore, directly proportional to the lens diameter and inversely proportional to the lens power and the eye-lens separation. If we are interested in the field of view for foveal vision for the moving eye, t will have to be substituted for h.

Simple magnifiers are often specified not in terms of the lens power but in terms of "Magnification" $M = F/4$. A "4X" magnifier therefore has a lens power of 16 diopters. It is possible, then, to express the linear field of view also in terms of M. Clearly

$$QM = c/4hM.$$

All distances are in meters if M is defined as above, and if F is in diopters.

Similarly, for a simple magnifier with the object in the focal plane the angular field of view, as defined in equation (3), is

$$\tan \alpha = \left[\frac{1}{1 + hF}\right] \cdot \frac{c}{h} = \left[\frac{1}{1 + hF}\right] \tan \alpha' \qquad (3A)$$

where $\tan \alpha'$ is the angular subtense of the lens aperture at the center of the entrance pupil. As an example we may take the case of a +20 D. lens worn 20 mm. in front of the plane of the entrance pupil of the eye. The lens has a semi-diameter of 15 mm. and $c/h = 0.75$. The total apparent angular field of view is accordingly equal to 2 $\tan \alpha'$, where $\tan \alpha' = 0.75$ because we have an extent of $\tan \alpha'$ for each semi-diameter of the lens. In this measure the field of view of the lens is 74° but this is a misleading figure. Substituting the appropriate values in (1A) and (3A) we find that QM = 3.75 cm. and $\tan \alpha = 28°$. This means that when the object is in a position where it is conjugate to the retina for an emmetropic eye without accommodation, the total extent of the object plane visible through the lens is 7.5 cm. (i.e. 3.75 cm. each side of the optic axis) and that this represents a true angular field of 56°.

It is interesting to note that while the magnification of the retinal image in this case is independent of the eye-lens separation, the field of view is not. The closer to the eye the lens is fitted, the larger the field.

Application B. Object at infinity. This is the usual case of spectacle lenses for distance vision and here only equation (3) is applicable. It takes the form

$$\tan \alpha = \left[1 - hF\right] \; c/h = \left[1 - hF\right] \tan \alpha' \qquad (3B)$$

This demonstrates the fact that plus lenses decrease the field of view and minus lenses increase the field of view.

Application C. $h = l/F$. This is the case of the so-called Maxwellian view in which the entrance pupil of the eye is placed in the posterior focal plane of the lens. Considerable application of this type of system is made in visual experiments.

Equation (1) takes the form

$$QM = c \tag{1C}$$

and it follows that the linear field of view is independent of object position. This is a particular merit of this kind of system. Equation (3) becomes

$$\tan \alpha = \left[\frac{l}{l - uF} \right] \tan \alpha' \tag{3C}$$

and in the special case in which the object is placed in the anterior focal plane of the lens so that a clear image of it will be formed on the retina if the eye is emmetropic and unaccommodated, $u = -l/F$ and (3C) becomes

$$\tan \alpha = \frac{1}{2} \tan \alpha'. \tag{3C'}$$

Application D. Telescopic systems. Consider the case in which a visual aid consists of a positive object lens of semi-diameter c and of power F_1, and a negative eye lens of power F_2 separated from the first lens by a distance d. The second lens is situated at a distance h_2 in front of the center of the entrance pupil of the eye. It is not necessary to assume that the combination is a focal and the equation to be derived is, therefore, applicable to telescopic system for ametropic eyes as well as to systems for use at distances less than infinity. The aperture responsible for limiting the field in such systems is almost always the opening of the object lens and this will be assumed to be the case here.

Figure 5 shows the path of a ray from an object point through the system. It will be observed that the ray after passing through the first lens is not directed towards the center of the entrance pupil but towards the image of this point as formed by the second lens. After refraction by the second lens the ray will reach the center of the entrance pupil. If the latter is situated at a distance h_2 behind the second lens, and if h'_2 is th image distance with respect to the second lens, corresponding to h_2, the pathway of the rays in the object and image spaces of the first lens corresponds exactly to that in the previous cases. Our previous equations are, therefore, applicable without exception

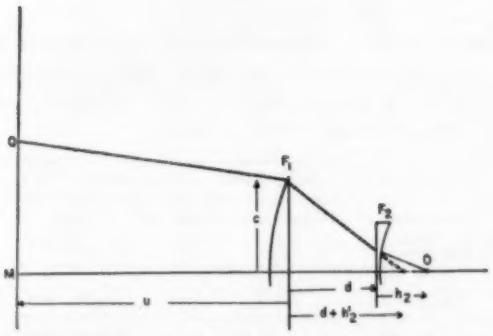


Fig. 5. Field of view of a visual aid consisting of a positive lens of power F_1 and a negative lens of power F_2, the two being separated by a distance d. The semi-diameter of the objective lens is c, the distance between the second lens and O, the center of the entrance pupil, is h_2. The image of O as formed by lens F_2 is at a distance $d + h'_2$ from lens F_1.

provided we substitute F_1, the power of the object lens, for F, the power of the single lens used previously, and provided that we substitute $d + h'_2$, the distance between the object lens and the image of the entrance pupil formed by the second lens, for h, the distance between the single lens and the center of the entrance pupil. It can be shown that

$$h'_2 = h_2/(1 - h_2F_2).$$

Equation (1), for example, takes the form

$$QM = \frac{c\ (d + h'_2 - u)}{d + h'_2} + cF_1\ u. \qquad (1D)$$

The total extent of the object plane visible is therefore 2QM, since the total aperture size of the object lens is $2c$. If the system is made up of a telescope over which is fitted a reading "cap," the value to be used for F_1 is the sum of the powers of the object lens and the reading cap.

The equations derived here are valid only for thin lenses and it is possible that in the case just mentioned the approximations involved may just begin to make themselves felt. In all instances, of course, the exact values may be determined by ray tracing procedures.

One widely used case is that a Galilean telescopic system with objects at infinity. Equation (3B) is applicable with $d + h'_2$ substituted for h and F_1 substituted for F. The magnification of such a system is given by $M = -F_2/F_1 = 1 - dF_2$. When the appropriate substitutions are made, equation (3B) takes the form

$$\tan \alpha = c / M \simeq (hM + d) \qquad (3D)$$

The field of view is, therefore, directly proportional to the aperture of the object lens and varies inversely with the magnification and eye-lens separation. A given telescopic visual aid will provide a larger field of view when fitted nearer to the eye.

	LINEAR FIELD	ANGULAR FIELD
GENERAL	$\frac{c}{h} \cdot (h - u + huF)$	$\left[\frac{h - u + huF}{h - u}\right] \tan \alpha'$
MAGNIFIER - Object in Focal Plane	$\frac{c}{h-u}$	$\left[\frac{1}{1 + uF}\right] \tan \alpha'$
LENS - Object at Infinity	.....	$\left[1 - uF\right] \tan \alpha'$
MAXWELLIAN VIEW	c	$\left[\frac{1}{1 - uF}\right] \tan \alpha'$
ditto $u = -1/F$	c	$\frac{1}{2} \tan \alpha'$
COMPOUND SYSTEM F_1, d, F_2	$\frac{c(d + h_2' - u)}{d + h_2'} + uF_{12}$	
TELESCOPIC SYSTEM Object at Infinity	.....	$\frac{c}{M(hM + d)}$

Table I constitutes a summary of the expressions for the peripheral field of view for the stationary eye under the various conditions considered. All equations are also applicable to the foveal field of view for the moving eye provided t is substituted for h throughout.

SUMMARY

Equations have been derived for the linear and angular fields of view of spectacle lenses, magnifiers and telescopic visual aids for near object distances and for objects at infinity. Emphasis has been placed on the application of these equations in subnormal vision aids, and in connection with these it is pointed out that the most useful measure of the field of view is the linear extent of the object plane visible to the eye. Attention is drawn to the difference between the field of view for foveal vision of the moving eye and for peripheral vision of the stationary eye and it is indicated how each may be calculated by appropriate substitutions in the formulas. The role played by the pupil of the eye is discussed.

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BIG DOINGS IN CHICAGO

Optometrists everywhere recognize the annual December Academy meeting as the big educational event of the year. All optometrists, Academy members and others, are invited to come to Chicago, the Drake Hotel, December 4 - 10, 1957, to take part in this full week of special activities.

During the first three days, December 4, 5 and 6 at the Drake, the Academy Post-Graduate Courses will be in full swing. There are 52 of these practical courses covering 124 full hours of special class instruction. These courses start at 8:00 A.M. and continue until 10:00 P.M. each day. In length, the courses vary from one to eight hours. Every one of these courses is specially prepared and given by an instructor who is a specialist in his subject, and who has had approved teaching experience. Optometrists may enroll in one or more courses of their choice. Some courses consist entirely of a class room lecture. Other courses are clinical and instrumental in character. A complete list of

these courses accompanied by a description of each and an application form for advanced registration will be found on pages 451-462 of the August issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

During the last four days, December 7, 8, 9 and 10, also at the Drake Hotel, Chicago, the Academy itself will be in session. All Academy members are expected to be present and non-members may also attend as sponsored guests. These guests will be most welcome.

The general educational program of the Academy will consist of the presentation by members of a large number of original papers. These will deal with the more advanced thinking in various aspects of refractive work. Most of this four-day period will be given over to these original papers and full discussion of them by members.

In addition, during this four-day period, the five Academy Sections will each hold three two-hour clinical sessions, in which each specialty will be reviewed and discussed and during which special reports dealing with the specialty will be read. The Sections are, Aniseikonia, Contact Lens Fitting, Occupational Optometry, Orthoptics and Pathology. The detailed programs for both the general education sessions and the sections will be presented in a later issue.

This year on December 7, 8, 9 and 10, the Illinois Optometric Association will also hold its annual meeting in Chicago at the Morrison Hotel. Academy members and their guests have been invited to attend the I. O. A. banquet on December 7 at the Morrison, and all I. O. A. members and their guests are invited to attend the Academy banquet on December 9 at the Drake Hotel. Several Academy members will appear on the I. O. A. educational program and in addition, the two groups will meet jointly on Sunday afternoon, December 8, at the Morrison Hotel, where the Academy will sponsor a three-hour symposium on orthoptics. All members of the Illinois Optometric Association are also especially invited to come to Chicago and enroll in the Academy Post-Graduate Courses held during the three days prior to the I. O. A. annual meeting.

The week of December 4-10 will be a big educational week for optometrists in Chicago. It is now expected that at least 1,000 optometrists will take part in the Academy Post-Graduate Courses and in the annual meetings of the Academy and the Illinois Optometric Association. The time to make your hotel reservations is now. Academy members and their guests should write to the Drake Hotel. I. O. A. members should write to the Morrison Hotel. Both the Academy and the I. O. A. conventions start on Saturday, December 7. The Academy

Post-Graduate Courses immediately precede these conventions.

Academy members everywhere are now urged to plan their travel to Chicago in December. This is an Academy *must*. The meeting is centrally located and easily reached from all parts of this country and Canada. Chicago is generally considered the best convention center in America, and members from all states and provinces can easily drive, ride or fly to the convention city. The program will be the best ever.

CAREL C. KOCH

SPECIAL REPORT

OPTOMETRIC AND MEDICAL ETHICS*

Vernon Ryan†
Pennsylvania State College of Optometry
Philadelphia, Pennsylvania

I have been thinking a great deal lately about ethics—ethics in the broad sense and ethics in the narrow sense, namely, about some aspects of professional ethics. I have come to the conclusion that professional ethics can acquire an exceedingly narrow and selfish viewpoint, a viewpoint so biased by self-interest as to preclude its acceptance as ethics in the real sense.

Ethics relates to the science of moral duty, more broadly, to the conception of ideal human character and the ideal ends of human behavior. We have what are called *absolute ethics*, which affirm an unchanging moral code; and we also have *relative ethics*, which regard moral values as varying with human development. Professional ethics may encompass both the relative and the absolute concepts. Relative ethics recognize that human nature and society, itself, are far from perfect. Therefore, relative ethics adapt themselves to the varying situations which arise in the course of human development, with the result that they often condone certain actions which are far from ideal. Insofar as such actions are the least of a number of possible evils, their acceptance must be considered as in harmony with our code of ethics.

*Read before the annual Senior banquet of the Omega Delta fraternity, Epsilon Chapter, Pennsylvania State College of Optometry, Philadelphia, Pennsylvania, May 22, 1957. For publication in the August, 1957, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.
†Optometrist. Member of faculty.

By adapting our ethics to ever-changing situations, we arrive closer to the standards of absolute ethics which envisage the *summum bonum* of humanity, for which we strive from age to age, never arriving, but always, we hope, making some measure of steady progress.

Ethics govern a group of individuals in the interests of their "tomorrow," as well as their "today." Ethics never concern themselves exclusively with either tomorrow or today. There are serious pitfalls awaiting those who dwell with undue emphasis on either the future or the present. There are pitfalls equally serious awaiting those who consider the future of mankind at the expense of the individual. However, ethics with its concern for the *summum bonum* of the whole fabric of humanity is obviously as much concerned with individual character as with the social order, for the two are as closely dependent upon one another as are the woof and the warp of any fabric. Together, they make a complete entity. However, as for men and the social order, I do not consider the two as of equal importance. In the absence of a Utopia, I choose good men in preference to a good order. Living among good men in a primitive social order is preferable by far to living in a superior social order dominated by undesirables. Let us not forget that there were good men in our society long before any of the religions known today had any organized existence. Also, let us not lose sight of the possibility that we may even yet create a fine social order conspicuously cursed by the presence of undesirables. An ethical code, then, must have regard for what it can do to the individual who upholds it as well as for what it can be expected to do for the community it aims to benefit. History affords numerous examples of the tragic failures made by man in his many strivings towards Utopia. Disaster is all too often the result when men in their zeal for the future ignore the consequences of their present actions. Man, in his impatience to achieve his ends, too often fails to give sufficient consideration to the future. In his blindness, man so often confounds himself and the issues involved that the very gods must throw up their hands in despair, if not in horror, at the sight of so much human contradiction and self-deception. Nowhere else in the universe can we find a paradox equal to man's lofty objectives and the contradictory means utilized by him in his endeavors to achieve anything worthwhile. More haste less speed, is an adage which can never hold more truth than when applied to man and his struggles for the ideal social order. In striving towards our ideal, we will find much of imperfection which must be handled not only with toleration but also with wisdom. This implies that in all intra-group and inter-group relationships and dealings there shall never be employed any

means which may conflict with the desired ends.

It is hardly possible for us to build a good social order by trampling on the present generation. It is hardly possible for us to build a good professional order by stooping to any unscrupulous means that ingenuity can invent in order to achieve a quick success. Those who curse the present in the interest of the future will themselves become a curse to the future. The social fabric is a blending of character and order. Let not men imagine that by achieving their ends through the sacrifice of present opportunities for doing good and by the employment of half-truths and downright lies and wanton villification of all who cross their paths, that they can one day change their spots and emerge into a better social and professional order as good men and true, worthy and able to enjoy that order properly. Character is character, and the means we employ make it or mar it—not merely for today but perhaps forever, or at least for a very long time to come. That great American author, Pearl Buck, in her best-selling novel of recent years, entitled *My Several Worlds*, speaks of her continual war against perfectionism in an imperfect world. I would like to quote a paragraph from this book.

"This is an old war of mine, this war against perfectionism in an imperfect world. I used to fight it in China against the American doctors and the western-trained Chinese doctors. While millions of people died of preventable diseases and millions more were blind from trachoma, the doctors went on with their high professional standards. That is, anyone who practiced medicine must be a graduate physician. But there were few who could be graduates; it was too expensive and there were two few medical schools. To go abroad was prohibitive, indeed. I used to argue—why do we need such high training for everybody? Why not train field workers who could give quinine for malaria, treat ulcers and wounds, swab eyelids for trachoma, yet who could realize when a malady was beyond their knowledge? These serious cases could be sent to a medical center, and if there too the illness was too grave, sent still further to a central hospital. But no, I was told, this was the absurd idea of a layman. I am now enduring considerable secret agony when I hear that the communists in China are doing exactly what I hoped could be done by our earlier professionals, and are getting full credit for it. The manner in which a job is done is certainly very important and the method should be the best possible. I put only one aim above it—to get the job done, for if one group fails to accomplish it, another will take over."

The above is just one instance where professional ethics, i.e., relative ethics, proved to be in error. Millions of people suffered because of an untenable ideal. I would like to offer another example of the same sort of error nearer home, in fact, right at home. One more major error in relative ethics is now being written into the annals of our social development. I refer to the problem of glaucoma. It is a generally accepted fact that at any moment, the number of undetected cases of glaucoma averages about one million in this country alone! Many of these cases defy detection by even the best of ophthalmic practitioners, if limited to a single examination. However, if people were encouraged

to undergo regular eye examinations and if optometrists were given the authority to utilize all the techniques required for the detection of ocular hypertension*—a simple procedure if ever there was one for practitioners so highly trained as the present day optometrists, then the number of cases of glaucoma which at present go undetected could be enormously reduced.

There is one basic difference between the case of unethical professional ethics which occurred in the far East and this case which is present right at home. Insofar as the far East is concerned, this was a case of full training versus a part training—perfectionism as opposed to lowered standards. However, in the case at home, perfectionism does not enter into the discussion. The background of the optometrist fits him perfectly and capably into the scheme for glaucoma detection. The difficulty here is professional jealousy, rather than a matter of perfectionism or lack of it.

Deep in the hearts of many medical practitioners there lingers an uneasy feeling that duty to the present generation is not being fulfilled. That feeling of uneasiness, however, is being smothered by propaganda launched from the minds of a few medical writers who are bitter toward optometry and are being urged on by guild opticianry. This propaganda asserts that organized medicine will frown upon cooperation of the medical eyeman with the optometrist in the battle against glaucoma.

The most glaring fact about this preposterous type of ethics is that it abandons thousands of sufferers from controllable eye defects to possible blindness. Rather than cooperate realistically with optometry and secure the detection of great numbers of existing cases of glaucoma, the "ethics" of the medical group permit it to throw to the winds the welfare of multitudes now living. This is being done in order to further the selfish interests of a professional organization. What kind of twisted consciences do these men possess? I refer, of course, to only a few men within organized medicine rather than to medical men as a group. What kind of ethics can they dream up next? If only Hippocrates were alive to see how his followers have distorted his teachings! They see no need to relate relative ethics to the absolute, no need to consider the means by which their ends are served. They institute a set of relative ethics which serve their own interests rather than the welfare of millions of people whose present interests should be put first. They use their "ethics" as a club to brandish before the world and to beat down anyone whose sphere of professional activities overlaps their own.

*Editor's note:—Optometrists may now use all techniques with but one exception.

When I speak of optometric ethics, what can I say? I can say that the ethics of optometry are not principles based upon sectional or group interests. They are not altered or reversed from year to year, as are those of organized medicine. Optometric ethics are based upon absolute, moral principles, and as such cannot be challenged. I regret that a certain number in our profession do not practice in accordance with our code of ethics. In most cases, this is because the practitioners in question have been driven to a violation of our ethics by circumstances, by being denied the proper self-respecting role for which they were trained, by the impact of constant slander and misrepresentation which the proponents of medical "ethics" encourage. When medical ethics are redefined to eliminate the inconsistencies and the injustices which are confused with real ethics, it will be much easier for optometry to "put its house in order" and to go forward in full cooperation with the other health groups to the advantage of all concerned. I would like to quote a few sentences from the book, *Human Nature and Conduct*, written by that great American philosopher, John Dewey.

". . . And is there, again, any intelligent way of modifying the future except to attend to the full possibilities of the present? Scamping the present in behalf of the future leads only to rendering the future less manageable."

Yes, scamping the present in behalf of the future. How true of some ophthalmologists. I was trying to say what Dewey has said so much better when I spoke earlier of those who curse the present only to become the curse of the future. I quote once again from Dewey.

"Note that present activity is the only one really under control. Control of future living, such as it may turn out to be, is wholly dependent upon taking present activity seriously and devotedly as an end, not as a means. And a man has his hands full in doing well what now needs to be done."

I would ask: Are certain ophthalmologists attending to the full responsibilities of the present? Or are they scamping the present in the hope that as a result they will all the better control the future as they would like to control it? Such scamping of the present will lead neither to better group control nor to better health control. It is to be hoped that wiser heads in medical circles will be restored to influence sufficiently to prevent the perpetration of a gigantic error, if not a crime, against humanity. I would ask: What about us, the optometrists? I have a simple answer. What better advice can I give to myself and to all of us than the following? Let us always attend to the full responsibilities of the present, for in satisfying the present adequately we can best assure ourselves of the future.

2024 72ND AVENUE
PHILADELPHIA 38, PENNSYLVANIA

BOOK NOTICE

BACKWARDNESS IN READING—A STUDY OF ITS NATURE AND ORIGIN. M. D. Vernon, M.A., Sc.D., Professor of Psychology in the University of Reading. (England). Published by the Cambridge University Press, New York City. 227 pages. Cloth. $4.75. 1957.

The optometrist is often consulted by parents of children who are backward in reading, since parents and teachers tend to attribute such failure to inability to see. Many times an eye examination reveals a condition sufficient to handicap the child, correction of which improves his ability to cope with his studies. However there are many others in which no such handicap is uncovered by optometric examination. Some of the difficulties lie outside the optometric field in teaching method or clinical psychology, but quite a few fall in the field of visual perception, on the borderline between optometry and educational psychology. These are not usually investigated in a routine eye examination.

Persons who meet reading cases, especially those in this category, are likely to find very helpful the new book by Dr. Vernon. This small, compact volume contains chapters on visual perception, auditory perception, the nature of reading disability, innate factors, the relation of acquired defects to reading and, finally, the effect of the environment.

A large number of the sections in this book relate to visual perception, visual defects, cerebral dominance, and word blindness. Others less closely allied to optometry are not neglected and include such things as discussion of auditory factors, speech and intelligence.

The book appears to contain a good review of the reading literature and should prove helpful to those who find themselves confronted by reading difficulty cases. It also provides background information which the optometrist may use in interprofessional relations with school people.

THOMAS H. EAMES, ED. M., M.D.

BOSTON UNIVERSITY
BOSTON 15, MASSACHUSETTS

BOOKS RECEIVED

REMEDIAL READING — TEACHING AND TREATMENT. Maurice D. Woolf, Ed.D., and Jeanne A. Woolf, M.A. Published by the McGraw-Hill Book Company, New York City. 424 pages. Illustrated. Cloth. $5.75. 1957.

TRANSACTIONS OF THE AMERICAN OPHTHALMOLOGICAL SOCIETY. Ninety-Second Annual Meeting, Hot Springs, Virginia. 1956. Published by the Columbia University Press. New York City. 832 pages. Illustrated. Cloth. $18.00. 1957.

CURRENT COMMENTS

Terry Judith Parkins
Editorial Assistant

Optometrists will confer a favor by sending news items of general interest for this department; such as relate to new instruments, clinical techniques, education, visual health and optometric legislation and organization.

POST-GRADUATE WORK IN GLAUCOMA RECOGNITION IN MINNESOTA

The Minnesota Optometric Association has arranged to bring Dr. Jay M. Enoch, member of the faculty, School of Optometry, The Ohio State University, Columbus, Ohio, to Minnesota the week of September 9-14 for a series of five similar, 5-hour post-graduate courses dealing with the new developments in the recognition of glaucoma for optometrists. Dr. Enoch is also the chairman of the Section on Pathology of the American Academy of Optometry.

These post-graduate courses will be held from 2:00 P.M. to 5:00 P.M. and continued from 7:30 P.M. to 9:30 P.M. in each of the following Minnesota cities:

Rochester, September 9, Kahler Hotel.
Willmar, September 10, Lakeland Hotel.
Park Rapids, September 11, Municipal Building.
Hibbing, September 13, Hibbing Junior College.
Minneapolis-St. Paul, September 14, Nicollet Hotel (Mpls.).

Every optometrist in the state is being instructed to attend one of these courses. A certificate showing attendance will be supplied by the Minnesota Optometric Association. Optometrists may attend the meeting of their choice, but it is imperative that every optometric practitioner receive this special training dealing with the newer techniques in the optometric recognition of this disease. Registration fee, a five-hour course, $5.00.

This special post-graduate program has been developed under the supervision of Dr. Arthur Tillisch, Minneapolis, president of the Minnesota Optometric Association, and Dr. John R. Kennedy, St. Paul, chairman of the association's Post-Graduate Committee.

PROPOSED OPTOMETRIC ABSTRACT JOURNAL

We are advised that plans are now being made to publish a quarterly abstract journal for optometrists. This will be called OPTOMETRIC ABSTRACTS. This new publication will abstract original papers from optometric and ophthalmological literature. In general the editors will select such material as will be of particular interest to optometrists.

This is not a new idea. It was first suggested by Dr. E. LeRoy Ryer, New York City, in 1922. His thought was to bring out an abstract journal as a companion quarterly to ARCHIVES OF OPTOMETRY. Dr. Ryer was then editor of Archives, which was published under the editorial supervision of the New York Academy of Optometry. This original idea was dropped because of a lack of support. Later on several other studies of the feasibility of publishing an abstract journal were made. One was conducted by the Academy itself. Again, absence of interest among optometrists led to the abandonment of the plans.

In 1947 the abstract journal EXCERPTA MEDICA, SECTION XII, OPHTHALMOLOGY, a monthly at $12 was started in the Netherlands. It is published in English. In 1956 the second abstract journal, SURVEY OF OPHTHALMOLOGY published bimonthly at $9 made its appearance here. These journals abstract many of the papers appearing in optometric literature, as well as a large number of papers dealing with ocular pathology. Both of these abstract journals are well edited.

Perhaps this is the time for an optometric abstract journal. We hope it is and we wish this new abstract publication the best of success. Its backers, we fear, will find the competition stiff and the interest small. Nevertheless, we hope they will make this new publication both useful and successful. We understand the subscription price will be $1 a copy, payable at $4 each year. The offices of OPTOMETRIC ABSTRACTS are 352 Merrick Avenue, East Meadow, New York. They plan to have their first issue in the mail some time this Fall.

THE IMPORTANCE OF VISUAL CARE

According to the U. S. Bureau of Labor Statistics the total expenditure for health care for the average family in this country is now $278. This figure is a Bureau estimate for 1957, based on a survey of actual expenditures made in 1950. The breakdown of this figure as compiled by the Bureau is as follows:

Physicians	$84
Surgeons	$10
Specialists	$ 5
Dentists	$46
Optometrists	$10
Hospital care	$15
Drugs and prescriptions	$46
Health Insurance	$62

In developing the above table the Bureau pointed out that the total cost of spectacles was included in the item designated as "optometrists."

From these figures it is evident that about 2¾ per cent of the health dollar is spent on refractive care. This amount is equal to that spent for surgical care and is two-thirds of the family personal total spent for hospital care. Broken down into a dollar total the estimated amount spent for refractive care including the cost of spectacles exceeds $425,000,000 annually. This is a sizable figure and indicates the importance of visual care in the overall health picture.

A DEMARCATION DISPUTE

The following paragraph is from a book review of the text *The Clinical Psychologist*. The author of this book is William A. Hunt, Ph.D. This paragraph has a familiar ring and indicates that optometrists are not alone in their problems with some physicians.

> "Though *The Clinical Psychologist* ostensibly deals with the training and functions of the clinical psychologist and the future of clinical psychology, a British reader will obtain very little information from it on these subjects. Psychiatric practice in America seems very different from that in this country, and the relations between psychiatrists and clinical psychologists are certainly radically different. Relations indeed seem so strained that the author has devoted most of his book to examining 'the current tension between clinical psychology and medicine,' saying how this tension has arisen and providing suggestions to remedy it. We are told that 'in the early years of this century, when psychiatry operated within an organic framework there was relatively little friction,' but 'as psychiatry has become the primarily dynamically and developmentally oriented discipline it is to-day' friction has arisen because psychiatrists are operating 'within a framework which has little to do with the physiological, organic orientation of medicine proper' but are 'more and more . . . drawing upon the formal knowledge of psychology.' This leads to what one would call, in trade-union terms, a demarcation dispute, or, as the author calls it, a boundary dispute; and he is reminded of the friction between medicine and dentistry over the boundaries of the alveolar process."

The above paragraph is from the review written by Eliot Slater that appeared in the July 6, 1957, issue of the BRITISH MEDICAL JOURNAL (London).

NEWS BRIEFS

The first of a new series of American Optometric Association, Four Start Forums, will be held in Oklahoma City, Hotel Skirvin, September 5-6. A.O.A. president-elect, Dr. Hoyt S. Purvis, Jonesboro,

Arkansas, will speak at the meeting and the banquet. The following A.O.A committee chairman will serve as speakers: Dr. Lois Bing, visual problems in schools; Dr. W. F. Hervey, motorists vision and safety; Dr. Felix Koetting, social and health care trends; and Dr. Don A. Frantz, practice management. Dr. Russell M. Koch, Elk City, Oklahoma, is chairman of the Forum. . . . A new act to regulate the practice of optometry in Manitoba, Canada, has been approved by the legislative assembly. This new law takes the place of the old optometric act and provides that applicants for registration as optometrists must be graduates of an approved College of Optometry and in addition that applicants must serve a "preceptorship in optometry" for not less than one year under the supervision of an optometrist registered in Manitoba before being examined for licensure by the board of examiners. . . . A regional forum for optometrists and public school educators dealing with visual problems in schools will be held at the Morrison Hotel, Chicago, September 28. Dr. J. A. Potter, Peoria, Illinois, will serve as general chairman. . . . Mr. Irving W. Wilson has been appointed the new vice-president for sales research and market planning for the American Optical Company, Southbridge, Massachusets. Mr. Wilson has been in charge of the lens division since 1952. The company has also announced a new safety lens named Aolite, made of plastic. . . . The Univis Optical Company, Dayton, Ohio, has announced a new bifocal called the Identified Segment I.S./22 with round corner segments that prohibit substitution. . . . The First Eastern Optometric Contact Lens Conference will be held in Pittsburgh, Roosevelt Hotel, September 8-9. Dr. Harry Wachs, Pittsburgh, will serve as chairman of the conference.

Dr. Irving Bennett, Beaver Falls, Pennsylvania has been appointed editor of the JOURNAL OF THE AMERICAN OPTOMETRIC ASSOCIATION. Dr. Bennett is the former editor of the PENNSYLVANIA OPTOMETRIST and in his new staff position he replaces Dr. Ernest H. Kiekenapp, Minneapolis, who has now retired. . . . The Optometric Extension Program has now been established as a non-profit corporation. Its officers and directors are, Dr. E. B. Alexander, Tarzana, California, president and executive director; Dr. George A. Crow, Los Angeles, vice-president; Dr. Homer Hendrickson, Temple City, California, secretary-treasurer; Dr. A. M. Skeffington, St. Louis, director of education, and Dr. Glenn H. Moore, Chicago, Trustee. The Optometric Extension Program will continue to operate from its Duncan, Oklahoma office.

TRANSACTIONS OF THE ACADEMY
AMERICAN ACADEMY OF OPTOMETRY

A department devoted to announcements, reports, appointments, organization data, news, professional problems and ideals, as these relate to the Academy.

AMERICAN ACADEMY OF OPTOMETRY

POST-GRADUATE COURSES

Drake Hotel
Chicago, Illinois
December 4, 5, 6
1957

Committee on Instruction
V. J. Ellerbrock, Chairman
H. M. Fisher
G. Westheimer

Committee on Administration
D. G. Hummel, Chairman
R. Ehrenberg
M. H. Kaubl

GENERAL INFORMATION ON POST-GRADUATE COURSES

Time: All courses are scheduled for the three days immediately preceding the regular annual meeting of the Academy.

Place: All of the courses will be taught in the Drake Hotel.

Applicants: Any optometrist may apply for one or more courses.

Cancellation: In case of cancellation by applicant the fee will be returned, providing such cancellation is received no later than November 16, 1957.

Cost: The cost per hour of instruction is $2.00 unless otherwise specified.

Enrollment: For most of the courses the enrollment is limited to 30. Several very specialized courses, however, are limited in enrollment as indicated in the description of the courses.

Number of Courses: Fifty-two (52).

Hours of Instruction: One hundred and twenty-four (124).

Applications: All applications should be sent to Dr. D. G. Hummel, The National City Bank Bldg., Cleveland, Ohio.

Deposit: One-half the total fee for each course must accompany the application. The balance must be paid at the commencement of the courses. The courses designated with an asterisk (*) are limited in enrollment. Applications for these courses must be accompanied by the full fee.

Tickets: Without exception, everyone enrolled in a course must register and pick up the appropriate ticket. Without it, no one can be admitted.

Lecture Rooms: These will be posted at the registration desk. The hotel bulletin board will state the location of the registration desk. Please check your time schedule of courses. The Committee cannot be responsible for conflicts of scheduling.

KEY TO DESIGNATION OF PERIODS

Time	Wednesday	Thursday	Friday
8:00 A.M.	W-8	T-8	F-8
9:00	W-9	T-9	F-9
10:00	W-10	T-10	F-10
11:00	W-11	T-11	F-11
12:00	W-12	T-12	F-12
1:00 P.M.	W-1	T-1	F-1
2:00	W-2	T-2	F-2
3:00	W-3	T-3	F-3
4:00	W-4	T-4	F-4
5:00	W-5	T-5	F-5
8:00	W-E	T-E	F-E

Note: In program of Courses, (E) denotes 8:00 P.M Evening Course.

Course 1
Subjective Testing Procedures
Merrill J. Allen, O.D., Ph.D.
Bloomington, Indiana
A two-hour course—$4.00
Periods: F-2, F-3

A review of subjective test procedures used in an eye examination with special consideration of some of the more frequent sources of error and causes of test failure. The following tests will be covered: visual acuity, binocular balance tests, astigmatism tests at distance and near, bichrome test and the effects of distance test criteria on the near test findings.

Course 2
Efficiency in the Optometric Examination
Merrril J. Allen, O.D., Ph.D.
Bloomington, Indiana
A two-hour course—$4.00
Period: F-E

An evaluation of the purpose of an optometric examination and of the tests constituting an examination. A breakdown of the examination into the time required for its components with emphasis on streamlining by test grouping, eliminating waste motion and faulty questioning.

Course 3
Accounting and Taxation Practices for Optometrists
Leonard Schanfield, LL.B.
Chicago, Illinois
A three-hour course—$6.00
Periods: W-8, T-8, F-8

The professional man in private practice is in many respects in a unique position with regard to taxation regulations. The special advantages and disadvantages will be described and recommended practices will be outlined.

Course 4
Phorias — Physiological Considerations and Practical Applications
Mathew Alpern, O.D., Ph.D.
Ann Arbor, Michigan
A two-hour course—$4.00
Periods: T-4, T-5

Course will be devoted to a study of the behavioral and physiological factors which influence the magnitude of the phoria measurement. Recent studies of the basic characteristics of the phoria position will be reviewed and the application of such information to clinical practice will be emphasized. A comparative analysis of various phorometry techniques will be made and the problems and pitfalls in applying phoria data to arrive at the prescription will be pointed out. Emphasis will be on horizontal phoria measurements but a brief discussion of the problems of vertical phorias will be presented also.

Course 5
Recent Advances in Visual Science
Mathew Alpern, O.D., Ph.D.
Ann Arbor, Michigan

SCHEDULE OF COURSES BY HOURS

Hour	Wednesday (W)	Thursday (T)	Friday (F)
8:00 A.M.	3 51 36	3 51 23	3 18 29
9:00 A.M.	32 34 36	32 34 28	24 18 29 41
10:00 A.M.	27 43 31 15	27 43 35 15	6 5 45 17
11:00 A.M.	27 43 31 15	27 43 35 15	6 5 45 17
12:00 noon	38 49 39	38 14 50	25 48 26 33
1:00 P.M.	9 49 35	10 48 50	11 48 26 33
2:00 P.M.	27 43 47	27 43 47 42	12 1 52 16
3:00 P.M.	27 43 47	27 43 47 42	12 1 52 42
4:00 P.M.	21 8 40	21 13 4 46	21 7 19
5:00 P.M.	22 37 50	22 37 4 46	22 37 19
8:00 P.M.	30 44 20	30 44 20	30 44 2

A two-hour course—$4.00

Periods: F-10, F-11

A review of theoretical and experimental results of recent publications in the field of visual science and physiological optics will be presented. Emphasis will be placed on those works which seem most likely to have a lasting effect upon future thinking and clinical practice. These will include work in visual physiology, movements of the eyes and their relation to the visual act, accommodation, convergence, pupil size, and visual psychophysics. Work which especially points out deficiencies in our current theoretical positions will be discussed and wherever possible the direction of revision of theory will be indicated.

Course 6
Refraction of the Pre-School Child
Neal J. Bailey, O.D., Ph.D.

Bloomington, Indiana

A two-hour course—$4.00

Periods: F-10, F-11

Clinically tested examination and office handling techniques useful for very young children will be presented.

Course 7
Sunglasses
Neal J. Bailey, O.D., Ph.D.

Bloomington, Indiana

A one-hour course—$2.00

Period: F-4

A brief discussion of the physiological effects of radiant energy upon the visual mechanism with special emphasis on the clinical applications of absorptive lenses will be presented. Similarities and differences between commercially available sunglasses will be demonstrated.

Course 8
Space Eikonometer Technique of Measuring Aniseikonia
Robert E. Bannon, O.D.

Southbridge, Massachusetts

A one-hour course—$2.00

Period: W-4

The course will be devoted to the step-by-step procedure of measuring aniseikonia with the Space Eikonometer. The presentation will include not only the technique for the usual patients but also for the more complicated cases which have difficulty in making reliable responses. The material will be practical and based upon actual clinical experiences. Specific questions germane to the technique of measuring aniseikonia may be submitted at the beginning of the hour and will be discussed during the course.

Course 9
Clinical Judgment in Prescribing Aniseikonic Corrections
Robert E. Bannon, O.D.

Southbridge, Massachusetts

A one-hour course—$2.00

Period: W-1

Designed as a complement to Course 8. This course will consider what should be done with the measurements, i.e., what Rx should be prescribed. Partial corrections, spherical equivalents, and approximations resulting from changes in base curves and thicknesses will be discussed. Actual case histories, including data on what was measured and what was prescribed, will be reviewed and questions submitted at the beginning of the hour will be considered.

Course 10
Management of Difficult Refractive Problems
Robert E. Bannon, O.D.

Southbridge, Massachusetts

A one-hour course—$2.00

Period: T-1

Unrelieved symptoms and unsatisfactory refractive findings may be considered as "difficult refractive problems." Symptoms and history will be discussed from the standpoint of visual, ocular, and referred disturbances. A review of auxiliary investigations will include comparison of astigmatic chart versus cross-cylinder findings, binocular refractive techniques, cyclodamia and cycloplegia, accommodative astigmatism, monocular occlusion and binocular anomalies.

Course 11
Practical Aspects of Multifocal Corrections
Robert E. Bannon, O.D.
Southbridge, Massachusetts
A one-hour course—$2.00
Period: F-1

Procedures for determining the addition for various working distances, indications for temporary or diagnostic corrections, and considerations necessary in anisometropic and heterophoric cases will be reviewed. The optical features, image jump, object displacement, size of reading field, and ranges of clear vision will be discussed together with some points on analysis of occupational requirements. Many difficulties in a patient's adjustment to his multifocal correction can be prevented by proper attention to those factors.

Course 12
Evaluation of School Testing Procedures
Lois Bing, O.D.
Cleveland, Ohio
A two-hour course—$4.00
Periods: F-2, F-3

A discussion of methods and instruments for screening school children's vision and procedures for evaluating findings and follow-up. This course will be of particular value to optometrists who may be called upon to participate in screening programs in schools.

Course 13
Review and Evaluation of Reminder Systems
Paul L. Connolly, O.D.
Royal Oak, Michigan
Milton Hathaway, O.D.
Pontiac, Michigan
A one-hour course—$2.00
Period: T-4

Reminder systems have proven to be a very important part of many successful practices. The design of a number of the most popular ones will be explained in detail. This will include data on frequency of mailing, effectiveness, use of postage meter as well as use of other office mailings.

Course 14
Signs and Symptoms of Aniseikonia
Paul L. Connolly, O.D.
Royal Oak, Michigan
A one-hour course—$2.00
Period: T-12

Every new refractive correction produces changes in the ocular images and in the conditions under which the patient sees. Whether these changes are clinically significant depends not only upon their magnitude but also upon the patient's tolerances and his psycho-physical characteristics. These factors will be discussed and evaluated in the light of several years' experience. This discussion will lead to helpful clues for suspecting aniseikonia as a possible cause of headaches, asthenopia, and other visual disturbances.

Course 15
Streak Retinoscopy
J. C. Copeland, O.D.
Chicago, Illinois
A four-hour course—$8.00
Periods: W-10, W-11, T-10, T-11

This course is intended for those who wish to improve their skills in objective testing. Many new innovations in teaching the Streak Technique will make the course of special interest to both those who now use the Streak Retinoscope and those who desire to begin its use. Each student will be provided with all necessary equipment including a retinoscope, schematic eye, transformer and lenses. The course is conducted so as to give each man personal supervision and instruction as well as lectures for the group.

Course 16
Dispensing Eyewear for Children
Margaret S. Dowaliby, O.D.
Los Angeles, California
A one-hour course—$2.00
Period: F-2

A description of new ophthalmic materials available for children including lenses, frames and assorted accessories. Practical applications will be emphasized.

Course 17
Color in the Feminine Wardrobe
Margaret S. Dowaliby, O.D.
Los Angeles, California
A two-hour course—$4.00
Periods: F-10, F-11

A complete discussion of the importance of color as related to eyewear from two viewpoints: the patient's own coloring and a consideration of wardrobe.

Course 18
Case History
Jay M. Enoch, O.D., Ph.D.
Columbus, Ohio
A two-hour course—$4.00
Periods: F-8, F-9

The methods of pin-pointing the patient's visual problem will be discussed, and a classification of objective and subjective symptoms will be presented. In addition, the problem of putting the patient at ease and eliciting his cooperation will be reviewed. Consideration will be given to the importance of the practitioner's first estimate of the case, and the organization of the remainder of the examination.

Course 19
Ocular Manifestations of Diseases of the Central Nervous System
Jay M. Enoch, O.D., Ph.D.
Columbus, Ohio
A two-hour course—$4.00
Periods: F-4, F-5

One of the most important responsibilities of an optometrist is the early recognition of diseases of the central nervous system and proper referral of such cases. The detection, recognition and prognosis of these diseases will be discussed. The conditions will be described and their interference with ocular motility and vision will be considered.

Course 20
Optometric Applications of Vision Testing Programs in Highway Safety and Industry
Richard Feinberg, O.D., Ph.D.
Petersburg, Virginia
Reuel A. Sherman, D.O.S.
Petersburg, Virginia
A four-hour course—$8.00
Periods: W-E, T-E

Review and new considerations for optometrist entering Highway Safety and Industrial Eye Care Programs. Techniques of organization and operation. Slide and instrument demonstrations.

Course 21
Visual Rehabilitation of the Partially Blind
William Feinbloom, O.D., Ph.D.
New York, New York
Irving P. Filderman, O.D.
Memphis, Tennessee
C. Edward Williams, O.D.
Denver, Colorado
A three-hour course—$12.00
Periods: W-4, T-4, F-4
Enrollment limited to 15.

This course will present the role of the optometrist today in the field of rehabilitation. The history, purpose, and present organization of the blind and partially blind agencies in this work will be reviewed.

It has now been amply demonstrated that it is desirable for optometrists to be associated with these agencies. The *Modus Operandi* for such cooperation will be explained. The sociological, psychological, and education problems involved with various optical aids also will be presented.

Course 22
Sub-Normal Vision Clinic
William Feinbloom, O.D., Ph.D.
New York, New York
Irving P. Filderman, O.D.
Memphis, Tennessee
C. Edward Williams, O.D.
Denver, Colorado
A three-hour course—$12.00
Periods: W-5, T-5, F-5
Enrollment limited to 15.

A clinical program designed to present and analyze problems encountered in sub-normal vision cases. The application of visual aids in caring for partially sighted patients will be covered in detail.

Course 23
The Role of Aniseikonia in Optometric Practice
Benton C. Freeman, O.D.
Allentown, Pennsylvania
A one-hour course—$2.00
Period: T-8

Based upon 15 years experience in the measurement and correction of aniseikonia, the value of being able to measure image size differences in routine optometric practice will be discussed and augmented by illustrative case reports. Some of the problems and pitfalls in applying aniseikonia data to arrive at a prescription will be presented with observations relative to the personal satisfaction of handling aniseikonic patients.

Course 24
Evaluation of Quality in Ophthalmic Lenses
G. A. Fry, O.D., Ph.D.
Columbus, Ohio
A one-hour course—$2.00
Period: F-9

For several years the speaker has been Chairman of the Standards Committee of the A.O.A. and represents Optometry on an American Standards Association Committee on spectacle lenses. He will demonstrate methods of testing ophthalmic lenses for quality and show what defects cannot be permitted and how such defects can be most readily detected.

Course 25
Testing Stereopsis
Glenn A. Fry, O.D., Ph.D.
Columbus, Ohio
A one-hour course—$2.00
Period: F-12

A description of the various methods of measuring stereoscopic acuity will be provided. Attention also will be given to the effect of accommodation, convergence, training and optical systems on this function.

Course 26
Amblyopia
Ernest Giglio, O.D.
Bernardsville, New Jersey
A two-hour course—$4.00
Periods: F-12, F-1

One of the most prominent problems in optometric practice is the decision whether a patient with amblyopia can be helped. This course is designed to provide an up-to-date review of diagnostic procedures and of methods of training, with special emphasis on the probability of success.

Course 27
Advanced Course in Contact Lenses
Robert Graham, O.D.
Pasadena, California
William Feinbloom, O.D., Ph.D.
New York, New York
John Neill, O.D.
Philadelphia, Pennsylvania
William Policoff, O.D.
Wilkes-Barre, Pennsylvania
An eight-hour course—$32.00
Periods: W-10, W-11, W-2, W-3, T-10, T-11, T-2, T-3
Enrollment limited to 12.

Techniques for maximum success in the fitting of modern contact lenses. The course includes a thorough exposition of the methods for securing optimum results in regular cases, as well as procedures employed in handling the more complicated and difficult problems. The course is for those who already have substantial experience in the fitting of contact lenses.

Course 28
Basic Factors in Space Perception
Salvi S. Grupposo, O.D.
Southbridge, Massachusetts
A one-hour course—$2.00
Period: T-9

A review will be given of the factors in normal space perception or spatial localization with particular reference to the role of stereopsis. This will be followed by a discussion of the distortions in the stereoscopic perception of space, the effects of aniseikonia, and clues for its detection in routine optometric practice.

Course 29
The Effect of Radiation on the Eye
Sylvester K. Guth, E.E., D.O.S.
Cleveland, Ohio
A two-hour course—$4.00
Period: F-8, F-9

Sources of radiant energy, spectral distribution units of measurements. Physiological and psychological effects of radiant energy from various spectral regions including the non-visual spectrum and nuclear radiation. Possible methods of eye protection and the role of the optometrist in this connection will be reviewed.

Course 30
Ocular Pathology Review
Organized by the Section on Pathology American Academy of Optometry

Members of the Section will participate during the 3 two-hour evening periods.

M. J. Hirsch, O.D., Ph.D.
A six-hour course—$12.00
Periods: W-E, T-E, F-E

Course 31
Current Thinking in Myopia
M. J. Hirsch, O.D., Ph.D.
Ojai, California
A two-hour course—$4.00
Periods: W-10, W-11

A viewpoint concerning the many theories on myopia is slowly emerging. A discussion will be presented of new experimental findings and current thinking with a view to its practical application to the myopic patient.

Course 32
Recommended Insurance Practices for Optometrists
Myron Hecht
Chicago, Illinois
A two-hour course—$4.00
Period: W-9, T-9

There has been a spectacular growth in practically all types of insurance in the last several years. It is highly desirable, even quite necessary, for optometrists to have some types while quite incidental to purchase other forms. These will be evaluated. A basic insurance program for the optometrist also will be described.

Course 33
The Role of Eye Movements in Visual Acuity
Henry A. Knoll, Ph.D.
Los Angeles, California
A two-hour course—$4.00
Periods: F-12, F-1

Two recent developments relating to eye movements and their relationship to visual acuity lead to important theoretical and practical considerations. The first of these developments relates to the role played by eye tremors in maintaining high retinal resolution. The second development concerns the measurement of visual acuity during following eye movements, i.e., dynamic visual acuity. The most recent advances in these two fields will be reviewed and their significance discussed.

Course 34
Vertical Heterophorias
J. Donald Kratz, O.D.
Souderton, Pennsylvania
A two-hour course—$4.00
Periods: W-9, T-9

A discussion of vertical heterophoria with emphasis on the differentiation of the concomitant and noncomitant types. A careful analysis of the methods of handling the progressive and stationary noncomitant types will be presented.

Course 35
Psychological Problems in Optometric Practice
Russell H. Levy, Ph.D.
A three-hour course—$6.00
Periods: W-1, T-10, T-11

(1) The organically affected patient. (2) The neurotic patient. (3) The psychotic patient. How to handle such patients when situation arises, and how to refer them to proper channels.

Course 36
Vision Training Procedures with the Correct-Eye-Scope
Leo Manas, O.D.
Chicago, Illinois
A two-hour course—$4.00
Periods: W-8, W-9

(a) Cheiroscopic Drawing—procedure, target modification, and results of training. (b) Van Orden Star—procedure, target modification, and results of training.

Course 37
Recent Advances in the Diagnosis, Prognosis and Treatment of Strabismus
Meredith W. Morgan, O.D., Ph.D.
Berkeley, California
A three-hour course—$6.00
Periods: W-5, T-5, F-5

Discussion of precise methods of determining the state of binocular vision in strabismus, the factors which must be considered in making a prognosis, the recognition of anomalous fixation and methods whereby normal binocular vision may be restored in favorable cases.

Course 38
The Turville Infinity Binocular Balance Test
Meredith W. Morgan, O.D., Ph.D.
Berkeley, California
A two-hour course—$4.00
Periods: W-12, T-12

The Turville method of determining the subjective refractive error of each eye while maintaining single binocular vision. The prescribing of vertical and base-in prisms with this method.

Course 39
House Calls and Visual Care of the Invalid Patient
Thaddeus R. Murroughs, O.D.
Santa Barbara, California
A one-hour course—$2.00
Period: W-12

The course covers the methods of rendering visual care to the invalid. Sample letters to prospective referees and a check list of minimum equipment is provided. Special refracting considerations are evaluated with respect to the degree and type of infirmity. Various methods of prescribing corrections are related to the type of illness, degree of acuity and degree of immobility.

Course 40
Unfavorable Prognostic Pointers in the Cure of Strabismus
Thaddeus R. Murroughs, O.D.
Santa Barbara, California
A one-hour course—$2.00
Period: W-4

Sixteen adverse features found in strabismus therapy are presented. A method of identifying and evaluating each of these handicapping conditions is presented. The aim is to furnish a method for screening out those cases which are unfavorable orthoptic risks.

Course 41
Therapeutic Procedures in Aphakic Patients
Thaddeus R. Murroughs, O.D.
Santa Barbara, California
A one-hour course—$2.00
Period: F-4

The spatial problems of the aphakic patients are described from the standpoint of magnification and role of vertex distance. The refractive and dispensing routine and aftercare are discussed with respect to instrumentation, lens tilt, center thickness, base-curves, and consideration in the selection of the prescribed lens. A complete outline is provided.

Course 42
Orthoptics for Strabismus Patients
Thaddeus R. Murroughs, O.D.
Santa Barbara, California
A three-hour course—$6.00
Periods: T-2, T-3, F-3

An overall outline of practical training procedures is presented and reviewed. Reasons for failure are stressed in order of importance. The fundamental training procedures are illustrated in terms of the objectives to be achieved. The peripheral field approach to orthoptics will be stressed. Training procedures are presented in terms of principles with specific examples on various instrumentations.

Course 43
Beginning Contact Lens
John Neill, O.D.
Philadelphia, Pennsylvania
and associates
An eight-hour course—$32.00
Periods: W-10, W-11, W-2, W-3, T-10, T-11, T-2, T-3
Enrollment limited to 12.

For this course, the assumption is made that the practitioner has no prior experience with contact lenses. A comprehensive study will be made therefore of the principles, design and fitting of modern contact lenses. A considerable part of the course will be devoted to practical instruction of fitting, insertion and removal.

Course 44
Subnormal Vision
William Policoff, O.D.
Wilkes-Barre, Pennsylvania
Alfred Rosenbloom, Jr., O.D.
Chicago, Illinois
A six-hour course—$24.00
Periods: W-E, T-E, F-E
Enrollment limited to 15.

This course will cover all aspects of this problem such as definition, causes, psychological factors, examination, placement in sight saving classes, etc. Various aids will be described and pertinent facts on their use will be presented. The role of the itinerant teachers' program also will be reviewed as well as the programs of rehabilitation of the partially blind.

Course 45
The Early Detection of Ocular Pathology
Jack H. Prince, F.B.O.A.
Columbus, Ohio
A two-hour course—$4.00
Periods: F-10, F-11

Color illustrations of pathological conditions, differential diagnosis and discussion of early symptoms.

Course 46
The Use of the Slit Lamp in Diagnosis
Jack H. Prince, F.B.O.A.
Columbus, Ohio
A two-hour course—$4.00
Periods: T-4, T-5

Discussion and color illustrations of normal and pathological conditions as seen through the slit lamp microscope. Emphasis will be given to the study of diabetes with this instrument, and to the anticipation of glaucoma on the basis of anatomical structure.

Course 47
The Optometrist's Relationship to the Reading Program
Alfred A. Rosenbloom, O.D.
Helen M. Robinson, Ph.D.
Chicago, Illinois
A four-hour course—$8.00
Periods: W-2, W-3, T-2, T-3

A brief presentation of the process of learning to read from the readiness period to maturity, with an opportunity to learn a new alphabet.

Presentation of the diagnosis of a retarded reader in which the contribution of the optometrist to the solution of the problem is clarified.

Course 48
Graphical Analysis
Max Schapero, O.D.

Los Angeles, California

A three-hour course—$6.00

Periods: T-1, F-12, F-1

An introduction to the principles of graphic analysis, with emphasis on the plotting of optometric data on the analytical graph, the detection of faulty findings, and the understanding of the basis of case analysis and prescription.

Course 49
Recent Advances in the Technique of Fitting a Ptosis Crutch
Paul F. Shulman, O.D.

Chicago, Illinois

A two-hour course—$4.00

Periods: W-12, W-1

The problem of ptosis will be discussed relative to its etiology and prognosis. The specific procedure for fitting a ptosis crutch will be demonstrated on a patient. The different means of attachment of a ptosis crutch to various types of frames will be demonstrated and the different types of wire used will be exhibited. A ptosis crutch will be made in the classroom from start to its final fitting on the patient's face. Pictures of before-after results will be shown and discussed. Printed material outlining the procedure will be distributed.

Course 50
Scleral Tonometry and Glaucoma
Paul F. Shulman, O.D.

Chicago, Illinois

A three-hour course—$6.00

Periods: W-5, T-12, T-1

A thorough discussion of glaucoma. Existing literature and research in the field of scleral tonometry will be reported and summarized. The specific use of the scleral tonometer will be described in detecting abnormal variations of intra-ocular pressure. Instruments will be available for members of the class to use on each other.

Course 51
Migraine
Harold Simmerman, O.D.

Wenonah, New Jersey

A two-hour course—$4.00

Periods: W-8, T-8

Migraine represents the single cause of a substantial percentage of headaches that confront the optometrist in routine practice. This course will be designed to aid in the recognition of migraine and to help the optometrist make a differential diagnosis of the migraine cases from the other causes of headaches. The etiology, diagnosis and treatment will be given, with special considerations in the optometric management of these patients.

Course 52
Tachistoscopic Training Procedures
Howard N. Walton, O.D.

Los Angeles, California

A two-hour course—$4.00

Periods: F-2, F-3

The relation of tachistoscopic training to the speed of reading has been under study for a number of years. As a result, a number of specific procedures have evolved. These will be reviewed and evaluated. This course will be of special interest to all optometrists engaged in any form of visual training.

CONDENSED SCHEDULE OF COURSES

Course	Instructor	Subject	Hours	Periods
1	Allen	Subjective Testing Procedures	2	F-2, F-3
2	Allen	Efficiency in the Optometric Examination	2	F-E
3	Schanfield	Accounting and Taxation Practice for Optometrists	3	W-8, T-8, F-8
4	Alpern	Phorias—Physiological Considerations and Practical Applications	2	T-4, T-5
5	Alpern	Recent Advances in Visual Science	2	F-10, F-11
6	Bailey	Refraction of the Pre-School Child	2	F-10, F-11
7	Bailey	Sun-Glasses	1	F-4
8	Bannon	Space Eikonometer Technique of Measuring Aniseikonia	1	W-4
9	Bannon	Clinical Judgment in Prescribing Aniseikonic Corrections	1	W-1

Course	Instructor	Subject	Hours	Periods
10	Bannon	Management of Difficult Refractive Problems	1	T-1
11	Bannon	Practical Aspects of Multifocal Corrections	1	F-1
12	Bing	Evaluation of School Testing Procedure	2	F-2, F-3
13	Connolly & Hathaway	Review and Evaluation of Reminder Systems	1	T-4
14	Connolly & Hathaway	Signs and Symptoms of Aniseikonia	1	T-12
15	Copeland	Streak Retinoscopy	4	W-10, W-11, T-10, T-11
16	Dowaliby	Dispensing of Eyewear for Children	1	F-2
17	Dowaliby	Color in the Feminine Wardrobe	2	F-10, F-11
18	Enoch	Case History	2	F-8, F-9
19	Enoch	Ocular Manifestations of Diseases of the Central Nervous System	2	F-4, F-5
20	Feinberg & Sherman	Optometric Applications of Vision Screening in Highway and Safety	4	W-E, T-E
21*	Feinbloom, Filderman & Williams	Visual Rehabilitation of the Partially Blind	3	W-4, T-4, F-4
22*	Feinbloom, Filderman & Williams	Sub-Normal Vision Clinic	3	W-5, T-5, F-5
23	Freeman	The Role of Aniseikonia in Optometric Practice	1	T-8
24	Fry	Evaluation of Quality in Ophthalmic Lenses	1	F-9
25	Fry	Testing Stereoscopies	1	F-12
26	Giglio	Amblyopia	2	F-12, F-1
27*	Graham, Feinbloom, Neill & Policoff	Advanced Course in Contact Lenses	8	W-10, W-11, W-2, W-3, T-10, T-11, T-2, T-3
28	Grupposo	Basic Factors in Space Perception	1	T-9
29	Guth	The Effect of Radiation on the Eye	2	F-8, F-9
30	Hirsch & Section	Ocular Pathology Review	6	W-E, T-E, F-E
31	Hirsch	Current Thinking in Myopia	2	W-10, W-11
32	Hecht	Recommended Insurance Practice for Optometrists	2	W-9, T-9
33	Knoll	The Role of Eye Movements in Visual Acuity	2	F-12, F-1
34	Kratz	Vertical Heterophorias	2	W-9, T-9
35	Levy	Psychological Problems in Optometric Practice	3	W-1, T-10, T-11
36	Manas	Vision Training Procedure with the Correct-Eye-Scope	2	W-8, W-9

Course	Instructor	Subject	Hours	Periods
37	Morgan	Recent Advances in the Diagnosis, Prognosis and Treatment of Strabismus	3	W-5, T-5, F-5
38	Morgan	The Turville Infinity Binocular Balance Test	2	W-12, T-12
39	Murroughs	House Calls and Visual Care of the Invalid Patient	1	W-12
40	Murroughs	Unfavorable Prognostic Pointers in the Cure of Strabismus	1	W-4
41	Murroughs	Therapeutic Procedures in Aphakic Patients	1	F-4
42	Murroughs	Orthoptics for Strabismus Patients	3	T-2, T-3, F-3
43*	Neill & Associates	Beginning Contact Lens Practice	8	W-10, W-11, W-2, W-3, T-10, T-11, T-2, T-3
44*	Policoff & Rosenbloom	Subnormal Vision	6	W-E, T-E, F-E
45	Prince	The Early Detection of Ocular Pathology	2	F-10, F-11
46	Prince	The Use of the Slit-Lamp in Diagnosis	2	T-4, T-5
47	Rosenbloom & Robinson	The Optometrist's Relationship to the Reading Problem	4	W-2, W-3, T-2, T-3
48	Schapero	Graphical Analysis	3	T-1, F-12, F-1
49	Shulman	Recent Advances in the Technique of Fitting a Ptosis Crutch	2	W-12, W-1
50	Shulman	Scleral Tonometry and Glaucoma	3	W-5, T-12, T-1
51	Simmerman	Migraine	2	W-8, T-8
52	Walton	Tachistoscopic Training Procedure	2	F-2, F-3

*In each Course the enrollment is generally limited to thirty. In Courses marked with an asterisk (*) the enrollment is limited to a smaller number because of the clinical or instrumental character of the course.

IN APPRECIATION

This third annual series of Academy Post-Graduate Courses will be a most outtanding one . . . and it will be made so by its distinguished corps of Instruc ors.

At this time the Academy wishes to express, to the many selected individual optometric practitioners and others who are serving as instructors; as well as to those faculty personnel from Illinois College of Optometry, Indiana University, Los Angeles College of Optometry, the Ohio State University, Pennsylvania State College of Optometry, University of California, University of Chicago and the University of Michigan who serve as instructors; and to the research personnel of the American Optical Company, Armorlite Company, Bausch & Lomb Optical Company, General Electric Company and the Titmus Optical Company who serve as instructors; our deep appreciation for their splendid cooperation in making this program of Post-Graduate Optometric Education possible.

THE COMMITTEE

FOR ADVANCE REGISTRATION: For the convenience of readers an Application Form will be found on the following page.

FOR ADVANCE REGISTRATION

AMERICAN ACADEMY OF OPTOMETRY

Post-Graduate Courses

Applications should be made to Dr. D. G. Hummel, 1318 The National City Bank Building, Cleveland 14, Ohio. One-half of the total fee must accompany the application. The balance must be paid at the commencement of the courses. Without exception, everyone enrolled in the courses must register and pick up appropriate tickets for each course. Without them, no one can be admitted. Acceptance of applications will be on a first come first serve basis. When the number allowable in any course is filled, applications will be received on a contingent basis and used in case of cancellation. In case of cancellation the fee will be returned, providing such cancellation is received no later than November 16, 1957.

Advance Order Sheet

Please check the courses you wish to take.

No. of Course	Instructor	Hours	Total Fee	Date	Time

Name_____

Address_____

City_____ State_____

For Use of the Committee on Administration

Deposit_____ Balance_____

Date Received_____

Notified_____ Date_____ Accepted_____ Contingent_____

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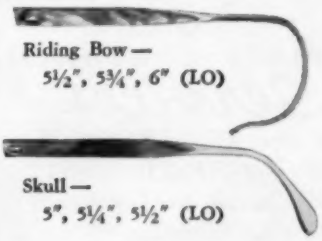

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5½", 5¾", 6" (LO)

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- Just because the tint of a lens looks like Therminon does not mean the effectiveness is the same. A patient wearing Therminon on one eye and an imitation on the other might report a serious complaint. The prescribing doctor would have no way of testing the transmission and absorbing effects and you would be liable for substitution of an ℞.*
- Therminon is formulated with certain ingredients to absorb infra-red radiations and the tint or color has nothing to do with the effect. The color comes from the ingredients and is incidental.
- **Spot checks are being made on prescriptions calling for Therminon to determine if substitutions have been made.**
- Guarantee Certificates are sent with each pair of lenses to assure the doctor and the patient that genuine Therminon has been supplied, and a refractionist not receiving a guarantee certificate with his Therminon ℞ is being notified to return the finished lenses to the laboratory.

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* Consult your State Department of Health

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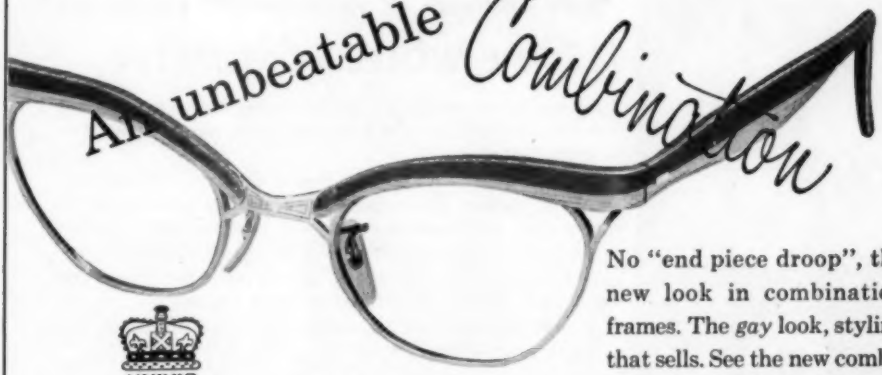

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